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AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
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OF THE AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
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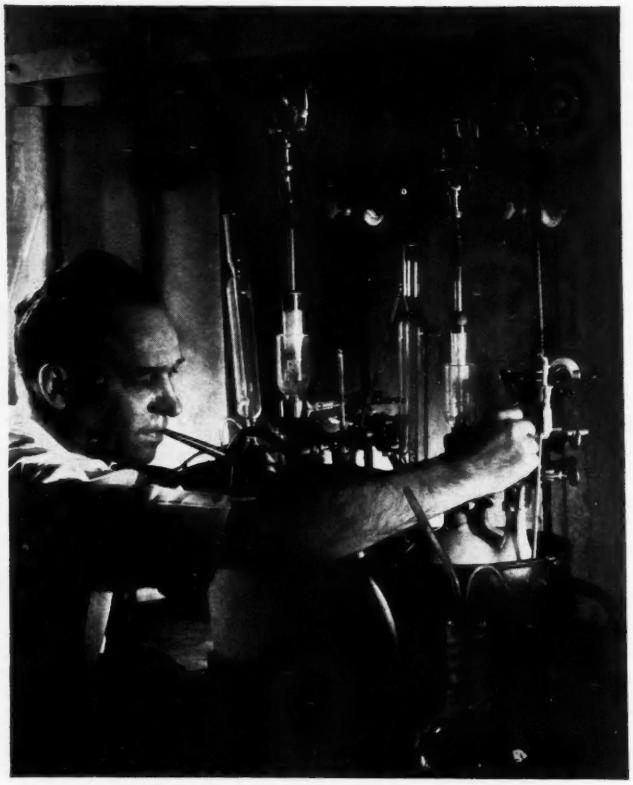

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OCTOBER 2, 1939

VOLUME 28 NUMBER 20

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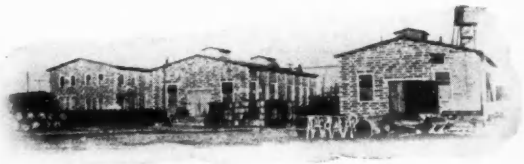

Calco Plant in 1915

Calco's Present Plant at Bound Brook, N. J.

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AMERICAN
DYESTUFF REPORTER

VOLUME 28 OCTOBER 2, 1939 NUMBER 20

The Processing of Acetate and Viscose Rayon Fabrics

Part VII—The Finishing of Acetate Rayon Flat Goods

C. B. ORDWAY, M.S.

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(Continued from July 24, 1939, issue)

MAINLY in the larger size jig dye-houses, there will be found jigs individually equipped with vacuum extraction units. The units are operated from a central vacuum pump station and have individual control valves for each jig. Vacuum extraction or suction pipes are designed with staggered serried lines of fine slots so arranged that they insure a uniform and gradual withdrawal of moisture from the fabric. Satisfactory operation is dependent upon the operative and the weight of the goods being extracted.

The medium and smaller size dyehouse usually operate with a single vacuum extraction unit equipped with individual vacuum pump. (See Figure 20, A Full Width Vacuum Machine, Part IV.) This places plants with only one vacuum extraction machine or none at all under various disadvantages to those plants using individually equipped jigs. These are:

1. Vacuum extraction of goods on completion of different operations as on developed acetate rayon colors. This is helpful in first, reducing the number of ends needed for rinsing or scouring, and second, insures greater freedom from crocking if goods are extracted and scoured afterwards, and third, it applies with equal value on bleaching operations.
2. Properly vacuum extracted flat goods can be controlled advantageously as to uniform take-up of finishing material either in the jig or on a quetsch.
3. Insures more uniform and rapid drying of goods when they are being run on the Palmer and helps to eliminate preliminary drying as may be necessary if no extraction unit is available either on jig or placed after quetsch as goods enter Palmer tenter unit.

ROUTING OF ACETATE RAYON FLAT GREIGE TO FINISHED FABRIC

1. Beaming.
2. Framing on short tenter frame. (This step used to remove wrinkles, creases, and give even ends on batch.)
3. Preparation, boil-off, and bleaching or dyeing.
4. Vacuum extraction. (If no extraction machine available, goods are given nip on quetsch with finishing material.)
5. Quetsch—with finish. (Finish is sometimes applied on jig.)
6. Palmer tenter.
7. Inspection. (First) (Check shade, etc.—goods, if satisfactory.)
8. Calendering.
   (8 B. Stiff and heavy goods may be run on button breaker.)
9. Framing for final width and hand.
10. Inspection (Final).
11. Tubing and shipment.

QUETSCH (PADDING OPERATION)

The finish may be applied on a heavy pressure quetsch of the two or three roll type either as separate operations or hooked up with the Palmer tenter unit as shown in Figure 40.

Improved types of quetsches suitable for handling all qualities of acetate fabrics are equipped with variable speed drive, adjustable pressure control, and adjustable let-off arranged to allow the goods to run either immersed in the finishing liquor or simply between the nips. This arrangement permits better control as to take-up of finishing material.

(See Figure 37—Two roll pressure quetsch.)

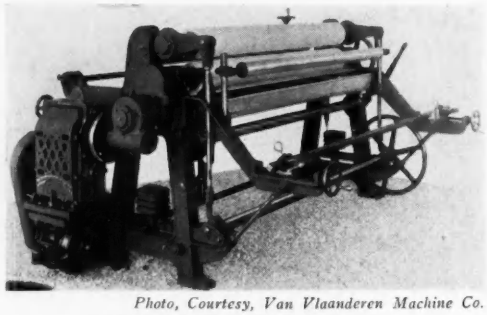
(See Figure 38—Three roll heavy pressure quetsch.)

Applying of finishing material to goods on jig requires a much larger amount than when applied on the quetsch. If the goods have been vacuum extracted, the amount of finishing materials can be reduced to a minimum in obtaining the desired effect on the finished goods.

FINISHING FORMULAS AS APPLIED ON QUETSCH

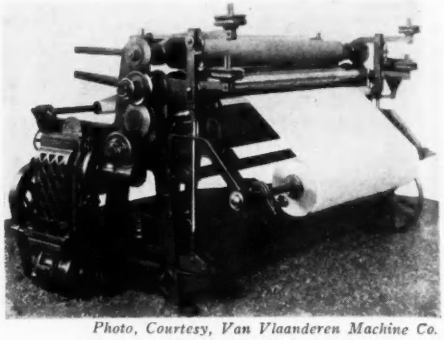
(All formulas are based on 40 gallons.)

2-5 lbs. hygroscopic agent (glycerine-diethylene glycol) added to all of the following formulas according to weight of goods processed and moisture pick-up required.



Photo, Courtesy, Van Vlaanderen Machine Co.

Fig. 37—Two-Roll Quetsch
(Equipped with variable speed drive, adjustable pressure and let-off arrangement)



Photo, Courtesy, Van Vlaanderen Machine Co.

Fig. 38—Three-Roll Quetsch
(Equipped similarly to machine in Fig. 37 with the additional feature of varying pressure possible with a three-roll machine)

Formula No. 1

2-5 lbs. sulfonated olive oil—75% applied at 100-120° F.

Formula No. 2

2-5 lbs. sulfonated technical oleyl stearyl alcohol.

Formula No. 3

1-3 lbs. sulfonated technical oleyl stearyl alcohol.
1-3 lbs. sulfonated and free technical oleyl stearyl alcohol.
Nos. 2 and 3 applied at 100-120° F.

Formula No. 4

1-2 lbs. sulfonated olive oil.
4-8 lbs. diethylamino ethyl stearamide hydro acetate.
Applied at 120-140° F.

Formula No. 5

1-2 lbs. sulfonated olive oil.
2-4 lbs. protein extraction—lecithin base compounds.
Applied in emulsion form at 100-120° F.

Formula No. 6

1-3 lbs. emulsified tallow.
Apply at 100-120° F.

These formulas can be applied with fairly satisfactory results for light goods, taffetas and satins on the jig but on the heavy goods (lining, etc.), the applications must be carried out on the quetsch for satisfactory results.

It is best to prepare these formulas with a pH of 5.0 to 7.0 range. These formulas will give different types of finishes ranging from a mellow to a soft full hand with a suitable break and drape on the finished goods.

There are various vegetable gums, resins, and gelatines used in combination or as a separate finishing bath with the Formulas Nos. 1-6.

Formula No. 7

Using Formulas Nos. 1, 2, 3, 4, 5, or 6 on a 40 gallon basis.
2-5 lbs. locust bean or Irish moss.
Properly emulsified, applied at 120-140° F.

This formula will give a soft hand suitable for heavyweight and lining goods.

Variations of Formula No. 7 can be used to obtain a non-slip finish but the lubricants or softeners must be reduced to a minimum and the other agents increased. If too great an excess of lubricants are used, the non-slip effect is nullified by these.

To obtain the full benefit of these inexpensive finishes it is best to increase the amount of acetic or formic acid used in final rinse on jig, as this will help to improve a uniform take-up of the finishing material as outlined. For a full weighted soft hand on the heavyweight and lining goods, Formulas Nos. 1-4 are usually increased one to two times and emulsified waxes are added on special finishes to give a heavier body to the goods.

The resins of the urea-formaldehyde type have been used successfully in combination with specially prepared plasticizers. Sulfonated olive oil or fatty alcohols have been used to replace the plasticizer and satisfactory finishes are obtained. The finishing or curing of resins require additional drying time and higher temperatures than that used on methods outlined under Formulas Nos. 1-5.

Finishes obtained through the application of urea-formaldehyde and different plasticizers duplicate to a large degree those prepared with the various vegetable gums. These finishes can be prepared to possess the non-slip, and other special finishing properties requested by the consuming trade and still have a desirable full soft hand. Goods finished with these resins require the necessary temperature and time for ageing or they may sometimes develop a disagreeable odor after being in storage a short period.

The acrylic acid ester resins possess good properties on special type finishes for acetate taffetas and heavy goods but they require specially prepared plasticizers made by the resin's maker to obtain the best results.

The application of the different resins and plasticizing agents for curing or ageing is best carried out by obtaining full recommendations from the makers in every case. Their technical recommendations are based on thorough chemical control and a technical knowledge of the fabrics that only a few of the larger finishing plants may possess or have the technical staff to furnish the information desired on the special finishes.

PALMER TENTERING UNIT

The Palmer tenter consists of several types of layouts. These are:

(See Figure No. 39—for layout No. 1.)

(Continued from page 599)

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

OCTOBER 2, 1939

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Members should notify the **Secretary** immediately of all address changes

• CALENDAR •
OF COMING EVENTS

Annual Meeting, Piedmont Section, Hotel Charlotte, Charlotte, N. C., October 7, 1939.

* * *

Meeting, Philadelphia Section, Penn Athletic Club, October 27, 1939.

* * *

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., October 27, 1939.

Fall Meeting, South Central Section, Andrew Johnson Hotel, Knoxville, Tenn., December 9, 1939.
(This is the date of the Auburn-Tennessee football game.)

* * *

Annual Meeting and Convention, auspices New York Section, December, 1940.

Fay-Foto

SCENE AT ANNUAL BANQUET

Nineteenth Annual Meeting and Convention

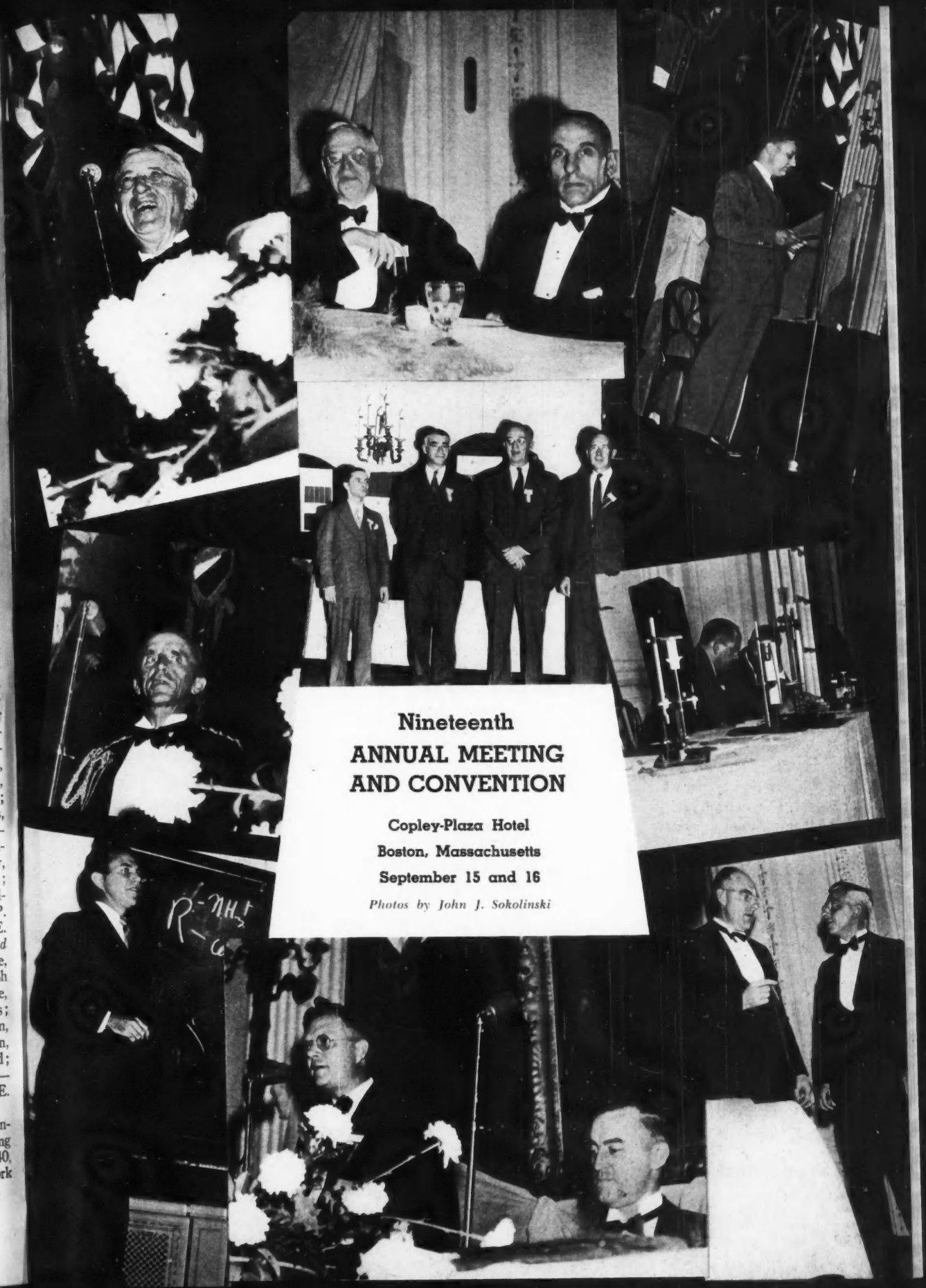
THE Nineteenth Annual Meeting and Convention, held under the auspices of the Northern New England Section, was carried to a successful conclusion at a well attended banquet in the Grand Ballroom of the Copley-Plaza Hotel in Boston, Mass., on September 16th. Most of those present had been on hand either since registration opened at 9 A. M. on September 15th or when the first technical session was held at 2 P. M. on that day. An excellent technical program had been prepared under the chairmanship of Dr. Carl Z. Draves and the general arrangements made by the committees of the Northern New England Section, under the chairmanship of Mr. W. H. Zillessen, were exceptionally well handled.

At the left is a photograph taken at the time of the annual banquet and on the page facing are a number of photographs of officers, committee members and speakers.

Commencing with this issue and continuing in future issues there will appear in the Proceedings complete reports of all papers presented, addresses delivered and discussions held.

There follows a list of the committee members who are responsible for another successful meeting of the association: *General Convention Committee*—Clarence Nutting, ex-officio, W. H. Zillessen, general chairman, Joseph A. Bryant, vice-chairman; *Technical Program*—Carl Z. Draves, chairman; *Publicity and Exhibits*—H. P. Selya, Chairman, John N. Dalton, Harold C. Chapin, R. E. Caffray, Herbert E. Wieland, E. R. Schwarz; *Reservations and Registrations*—Edward E. Bell, chairman, M. P. Graham, John H. Grady, Edwin E. Buthmann, Frank Rizzo; *Dining and Entertainment* — Michael J. Lane, chairman, Roland E. Derby, Joseph A. Bryant, Jr., Fred A. Dushame, George O. Linberg, Harry Emmons; *Reception*—K. H. Barnard, chairman, Alex Morrison, Hugh Christison, Frank E. Fleming, E. G. Goullaud; *Sight-seeing and Transportation* — Charles Schmitt, chairman, Delbert E. Ray, Gordon M. Thompson.

At the annual banquet it was announced that the next annual meeting would be held in December, 1940, under the auspices of the New York Section.



Nineteenth
ANNUAL MEETING AND CONVENTION

Copley-Plaza Hotel

Boston, Massachusetts

September 15 and 16

Photos by John J. Sokolinski

The Dyeing of Nylon Fibers*

A Preliminary Survey

P. H. STOTT**

THE official announcement last fall of nylon, an entirely new material to be manufactured by E. I. du Pont de Nemours & Co., Inc., naturally aroused public interest of varied kinds. Nylon is already familiar to many in the form of "Exton" bristles or as "Neophil," the sewing thread made from nylon which was introduced to the trade in November, 1938. Although nylon is the generic name for all material defined scientifically as synthetic fiber-forming polymeric amides having a protein-like chemical structure, the expression nylon is used in this paper and accompanying tables to designate the material produced in a small pilot plant which has been operating near Wilmington, Delaware. The fact that the new product can be produced in the form of yarns suitable for textile processing and that it is neither of vegetable nor animal origin but is entirely synthetic, adds greatly to this interest, as it becomes the first material suitable for textile purposes which is not dependent to some extent on nature for its creation. Those of us who were connected with the textile industry some fifteen years ago when cellulose acetate first began to be used will recall that the problem of dyeing it was an acute one. Very few of the then known dyestuffs had any affinity for cellulose acetate and even those which had were, in general, seriously lacking in fastness properties. It became necessary to create a new series of dyestuffs for the new fiber, and therefore, the statement that in general nylon could be dyed with the dyestuffs ordinarily used for wool, silk, acetate and in some cases those for cotton and rayon was encouraging. The statement meant, however, that the task of selecting those dyestuffs from the thousands available on the open market or described in the patent or other literature still had to be faced. This task is by no means complete but our investigation has progressed to the point that we feel justified in presenting the data accumulated up to the present time. It will serve at least, to indicate which classes of known dyestuffs are generally suitable for coloring nylon and that certain individual members of classes which have generally indifferent affinity, have been found by the method of trial and error to possess the property of coloring nylon. The publication of these data at this time will, we hope, prevent an arduous duplication of effort by others in the search for suitable dyes for nylon.

Before going on to the discussion of the dyeing of nylon, a brief survey of some of the physical and chemical properties of nylon fiber may be of interest.

PHYSICAL PROPERTIES

1. *Tensile*
   - A. Tensile strength—dry about 5 g. per denier
     wet about 4.4 g. per denier
   - B. Elongation—dry about 20 per cent
     wet about 30 per cent
   - C. Loop strength—dry 95 per cent of tensile strength
   - D. Elastic recovery—against no load.

% stretch	*% elastic recovery*
2	100
4	100
8	100
16	91

Stretch held 100 seconds, recovery in 60 seconds.

2. *Hygroscopicity*
   - A. Density—dry—1.14
   - B. Moisture regain

Rel. Humidity	*% Moisture (dry basis)*
10	.75
20	1.35
30	1.95
40	2.50
50	3.00
60	3.70
70	4.55
80	5.55
90	6.70

When thoroughly wet out and mechanically extracted nylon retains 20-25 per cent moisture.

CHEMICAL PROPERTIES

Nylon is very inert in the presence of reducing agents. In general it resists oxidizing agents well. For most purposes bleaching is not necessary; hypochlorites or peroxide have only a limited effect and the permanganate process is more effective if used in slightly higher concentration than for other fibers.

Acids

Acids show no appreciable effect in the cold up to concentrations of 5 per cent. Concentrated or hot solutions effect hydrolysis. Nylon is soluble in concentrated formic acid but not below a concentration of 10 per cent. Acetic acid has no solvent or swelling action.

Alkalis

The resistance of nylon to alkali is indicated by the fact that treatment with 10 per cent caustic soda solution

*Presented at Annual Meeting, Boston, Mass., Sept. 15, 1939.

**E. I. du Pont de Nemours & Co., Inc., Dyestuffs Division, Technical Laboratory.

at 80° C. for 10 hours causes a loss in strength of only about 5 per cent.

Nylon is also resistant to mildew, mold and moths.

Dyeing

The tabulations which have been distributed form the nucleus of the survey of the dyeing properties of nylon made to date. These tabulations include basic, direct, developed, acid, chrome, vat, sulfur and acetate rayon dyes, arranged in groups under the respective headings and classified by the Du Pont trade name and Colour Index number when the latter is available. The affinity of the various colors for nylon is also indicated. In cases where the use of acid is compatible with the normal dyeing process the effect of this is shown also. For example in the acid color group there are two columns Neutral and Acid, indicating the affinity of the dye for nylon from a neutral bath and also from a bath containing 3 per cent acetic acid on the weight of material. Concentrations of acetic acid higher than 3 per cent in general cause some increase in color absorption and the same statement can be applied to stronger acids such as formic and sulfuric. In the tables of vat, sulfur and acetate rayon dyes the affinity of color for fiber is indicated only when using conventional dyeing methods for these colors as applied to cotton, rayon, silk, or acetate.

From these tables of affinity dyes were selected which appeared to have value for the dyeing of nylon. These have been tested for fastness to a few of the more important requirements. Supplementary tables indicating these fastness properties have been prepared and are submitted herewith. An analysis of these data should reveal many facts of value to those who are interested in the dyeing of nylon and probably no further detailed comment is necessary at this time on the properties or fastness of any individual dyestuff. We wish, however, to emphasize at this point that our experience shows clearly that the fastness properties and in many cases the shade of any individual dyestuff on nylon cannot be interpreted in terms of its fastness and shade on another fiber.

It will be seen that a rough analysis of the dyes tested for affinity for nylon shows that the following groups are in general less satisfactory than the others—

Sulfur colors	Developed colors
Direct colors	Vat colors
	Naphthol colors

and that the following groups in general show from fair to excellent affinity—

Basic colors	Cellulose acetate colors
Acid colors	
Chrome colors	

The above statement refers to what we can call conventional methods of dyeing. There are indications that the affinity of certain colors or groups of colors can be enhanced by modification of dyeing methods. For example—The affinity of naphthol colors can be increased if the base, naphthol and sodium nitrite are mixed in a dye bath and the fiber treated in this solution. An addition of acid to the bath then induces coupling of the components on the fiber.

Also we have indications that some of the stabilized leuco esters of vat colors have affinity for nylon and that in some cases this affinity can be increased by the addition of acid before developing.

Our work also indicates that oxidation colors such as Du Pont Oxy Black Base, aniline black and products used generally for fur dyeing can be applied to nylon. Chrome or copper complexes of certain azo compounds such as the Palatine Fast and Neolan dyes have in some cases very good affinity for nylon fiber from acid dye baths.

On the basis of present information it appears that nylon resembles silk and wool in its behavior towards absorption of color more closely than it does vegetable fibers. To some extent this can be ascribed to its chemical constitution. The excellent affinity of cellulose acetate dyes is perhaps not so surprising if one considers that many of them will dye animal fibers and also that cellulose acetate is more plastic in nature than other cellulosic fibers. If one accepts the solid solution theory of dyeing cellulose acetate as being plausible, it is not impossible to apply such a theory to the dyeing of nylon with acetate rayon colors.

Acetate Rayon Colors

Our work has brought out the fact that the acetate rayon colors possess several characteristics which add to their value for the dyeing of nylon from a practical application standpoint.

1. As a group they have the property of building up in the dye bath in dark shades much better than acid or chrome colors. Probably due to the comparatively low water absorption of nylon many acid and chrome colors reach a saturation point and beyond that point final toning to shade is difficult. A good deal of work remains to be done to find the best combinations of acid and chrome colors from the standpoint of uniform exhaustion.

2. The acetate rayon colors are not unduly influenced in absorption by variations in pH of the dye bath whereas many of the acid colors of the neutral dyeing type are distinctly sensitive to alkaline conditions in regard to absorption.

3. Rings, two-tone effects, tiger stripes and barré are covered much more effectively with acetate rayon colors than with acid or chrome colors. Similarly yarn of varying denier can be dyed in the same dye bath to much closer similarity of tone.

4. The acetate rayon colors are simple of application requiring no dyeing assistants beyond "Modinal" ES Paste (Pat.), "Gardinol" WA Flakes (Pat.) or related products and in light to medium shades absorption is not influenced by reasonable variations in the ratio of dye-liquor volume to weight of goods.

5. Our observations indicate that the acetate rayon colors dyed on nylon possess the property of migration to an unusual degree. For example, it is possible to take several dyeings of different tone and depth, treat them together in a bath containing "Modinal" ES Paste (Pat.) and a little alkali at 180°-200° F. and practically equalize the shade on each dyeing. Such behavior indicates the level dyeing properties of acetate rayon colors on nylon and may have some practical value in the re-dyeing of hosiery.

6. The fact that acetate rayon colors in general do not stain cotton or rayon to any extent also adds to their interest for the dyeing of nylon in the creation of cross dye effects. A suitable range of direct colors leaving nylon clear is included in the tables submitted.

As a group it must be admitted that acetate rayon colors on nylon are not as fast generally as some of the acid or chrome colors but for many purposes we believe that they will be entirely satisfactory with judicious selection of individual dyestuffs for the particular purpose in mind.

Acid and Chrome Colors

As will be seen from the tables a great many dyes of the acid and chrome groups are available for dyeing nylon. In light to medium shades many of these, particularly the Du Pont Milling colors, exhaust well from neutral or slightly acetic acid dye baths. The addition of a stronger acid such as sulfuric or formic materially aids exhaustion particularly in the case of chrome and acid colors which normally require the use of these acids in applying these colors to wool or silk. Undoubtedly many light to medium shades demanding a high degree of fastness especially to light will be dyed with colors selected from the neutral and acid dyeing groups. In general the chrome colors exhibit very good fastness to washing at high temperatures, to severe hot wet pressing and to fulling. As previously pointed out heavy shades dyed with acid or chrome colors are difficult to control due to the saturation of the yarn. It is also frequently necessary to use higher concentrations of chemicals to obtain a desired effect than is the case when dyeing other textile fibers. Many chrome colors require greater quantities of chrome to effect complete chroming and frequently a longer time in the dye bath.

Basic Colors

Many basic colors have good affinity for nylon particularly from a neutral dye bath. As might be expected they are very fugitive to light and have a distinct tendency to crock and probably will be used to only a very limited extent.

Vat Colors

Reference to the tables will show that vat colors on the whole have very poor coloring power for nylon. The affinity is apparently very low by normal dyeing methods. As a group their light fastness is only moderate when compared with similar dyeings on rayon, cotton or silk and in many cases they are loose to crocking.

Direct Colors—Developed Colors

The number of direct and developed colors suitable for dyeing nylon is very limited. Those dyes which are normally suggested for union dyeing between cotton and wool or silk have more affinity for nylon than the average direct colors and even in these cases the affinity for nylon is not as great as the same dyestuff shows for the animal fibers. In all probability direct colors will find no great use for dyeing nylon although in some cases their affinity can be improved by the addition of acid to the dye bath.

Sulfur Colors

As might be expected sulfur colors generally have very low affinity for nylon and will probably hold no special interest for the dyer.

Our investigations indicate the following conclusions up to the present writing:

1. That a wide selection of dyes at present on the market is available for the dyeing of nylon fiber. The more important classes appear to be acid, chrome, basic and cellulose acetate dyestuffs.

2. That further investigation and experience is necessary to classify available dyes from the standpoint of fastness and dyeing properties compatible with various practical dyeing methods and specifications as the use of nylon fiber is developed in textile processing.

It is impossible to visualize all the potential uses of nylon as a textile fiber at this time. The initial production will be of paramount importance in the manufacture of hosiery, knit goods and sewing thread. It may be of interest to briefly review our work to date in these fields.

HOSIERY AND KNIT GOODS

The first experimental dyeing of hosiery was carried out with the neutral dyeing acid colors generally used for dyeing silk hosiery. Experience showed, however, that they left much to be desired from the standpoints of—

1. Uniform exhaustion under varying conditions of pH and dyebath volume. The presence of alkali or soap retards exhaustion at temperatures under 200° F. A dyeing temperature of 180° F. has been found most satisfactory for nylon hosiery.

2. Ability to cover rings and barré effects which are frequently encountered in all types of hosiery. Experience showed that acetate colors generally were very much superior to the neutral acid colors in these respects as was pointed out in the general remarks made under Acetate colors, and that they responded very satisfactorily to normal hosiery dye-house methods. Our tests indicate that popular hosiery shades can be produced with acetate dyes comparable in fastness to light and washing with pure silk hosiery at present on the market. The above remarks also apply generally to other types of knitted fabrics especially those intended for use in underwear garments.

SEWING THREAD

Up to the present we have not been able to duplicate the fastness of pure silk thread dyed with vat colors. We have

concentrated on the duplication of fastness properties of silk thread offered for domestic consumption and for the tailoring trade. Dependent upon the depth of shade and fastness specifications of any particular group selections can be made from the acid, chrome or acetate dyes. The acid and chrome dyes offer the best selection from the standpoint of fastness to light, severe washing and hot pressing, but as previously pointed out are difficult to control in heavy shades. Our experience so far is to the effect that a suitable selection of acetate dyes produces shades for both domestic and tailoring trades comparable in general fastness properties to silk sewing threads being marketed for those purposes.

Some time will elapse before the printing of nylon will become a practical operation, but we have done some preliminary work which indicates that it can be accomplished with a variety of classes of dyes including acid, vat, direct, chrome and acetate colors. Details of suitable methods will form the basis of further study as the demand for such information becomes of more general interest.

We hope that this preliminary survey of the dyeing of nylon will be of value to those interested in this subject. The data indicate that a great many known dyes possess affinity for fiber made from this new product and that such affinity varies with the method of dyeing employed, as is the case with all other textile fibers. It is anticipated that further experience and experiment will reveal much additional information in this regard and that others will contribute to the selective work necessary to be done to obtain the complete picture of color application to nylon.

AFFINITY OF VARIOUS CLASSES OF COLORS FOR NYLON FIBER

In the following tables, tables one to seven represent the affinity of various classes of dyestuffs for nylon fiber. Tables eight to ten show exhausting and fastness properties of certain groups as indicated by the headings.

The numbers and abbreviations used in the tabulations are to be interpreted as follows:

Absorption Rate	Headings	Rating of Color to Each Test
VR—Very rapid	L—Light shade	5—Very good
R—Rapid	M—Medium shade	4—Good
M—Medium		3—Fairly good
S—Slow		2—Moderate
		1—Poor

Light Fastness—Fade-Ometer

8—Excellent, or definite change on 300 or more hours' exposure.
7—Very good, or definite change on 240 hours' exposure.
6—Very good, or definite change on 120 hours' exposure.
5—Good, or definite change on 60 hours' exposure.
4—Fairly good, or definite change on 30 hours' exposure.
3—Moderate to poor, or definite change on 5 hours' exposure.
2—Poor, or definite change on 4 hours' exposure.
1—Poor, or definite change on 2 hours' exposure.

TABLE #1

ACID COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
Du Pont Azo Yellow Conc.	146	Good	Very good
Du Pont Metanil Yellow Conc.	138	Good	Very good
Du Pont Milling Yellow G	365	Fair	Good
Du Pont Milling Yellow 3G Conc.	—	Fair	Good
Du Pont Milling Yellow 5G Conc.	642	Fair	Good
Du Pont Milling Yellow GN	—	Fair	Good
Du Pont Milling Yellow R Conc.	—	Good	Very good
Du Pont Neutral Yellow GS	—	Very good	Very good
Du Pont Quinoline Yellow Conc.	801	Fair	Good
Du Pont Tartrazine O	640	Poor	Fair
"Pontacyl" Light Yellow GG	—	Poor	Fair
"Pontacyl" Light Yellow 3G	—	Poor	Fair
"Pontacyl" Light Yellow GX	639	Poor	Fair
Du Pont Milling Orange R	—	Good	Very good
Du Pont Milling Orange RN	—	Fair	Good
Du Pont Orange II Conc.	151	Fair	Fair to good
Du Pont Orange G	27	Poor	Fair
Du Pont Orange RO	161	Fair	Good
Du Pont Silk Orange R Conc.	234	Fair	Good
Du Pont Neutral Brown 2RS	—	Good	Very good
Du Pont Neutral Brown RS	—	Good	Very good
Du Pont Resorcin Brown 5G	234	Fair	Good
Du Pont Resorcin Brown 3R	235	Fair	Good
Du Pont Silk Brown R	—	Fair	Good
"Pontacyl" Fast Brown CGS	—	Fair	Good
Du Pont Azo Eosine 2B	—	Poor	Poor
Du Pont Azo Eosine G	114	Poor	Good
Du Pont Anthraquinone Rubine R Conc.	1091	Poor	Fair to good
Du Pont Brilliant Crocein FL	—	Poor	Fair
Du Pont Crocein Scarlet Conc.	252	Poor	Fair
Du Pont Crocein Scarlet N Extra	252	Poor	Fair
Du Pont Milling Red B Conc.	—	Fair	Good
Du Pont Milling Red 3B Conc.	—	Good	Very good
Du Pont Milling Red R Conc.	430	Good	Very good
Du Pont Milling Red SWB	430	Good	Very good
Du Pont Milling Red SWG	430	Good	Very good
Du Pont Scarlet 2R	79	Poor	Fair
Du Pont Scarlet Y	79	Poor	Fair
Du Pont Silk Red BW Conc.	275	Good to very good	Very good
"Pontacyl" Brilliant Red G	—	Poor	Good
"Pontacyl" Carmine 2B	—	Poor	Poor
"Pontacyl" Carmine 6B	57	Poor	Poor
"Pontacyl" Carmine 2G	31	Poor	Poor
"Pontacyl" Fast Red AS	176	Good	Very good
"Pontacyl" Light Red 4BL	—	Poor	Fair
"Pontacyl" Light Red BL	—	Poor	Fair
"Pontacyl" Light Scarlet EG	—	Poor	Poor
"Pontacyl" Ruby PL Conc.	—	Good	Very good
"Pontacyl" Rubine R	179	Poor	Fair
"Pontacyl" Scarlet 2G	431	Fair	Good
"Pontacyl" Scarlet R	487	Poor	Fair
Du Pont Anthraquinone Violet R	—	Fair	Good
Du Pont Anthraquinone Violet 3R	1080	Fair	Good
"Pontacyl" Fast Violet 10B	696	Poor	Poor
"Pontacyl" Fast Violet VR	758	Poor	Fair
"Pontacyl" Violet 12B	—	Poor	Fair
"Pontacyl" Violet 4BL	—	Poor	Fair
"Pontacyl" Violet 4BS	53	Poor	Fair
"Pontacyl" Violet C4B	698	Poor	Fair
"Pontacyl" Violet S4B	698	Poor	Fair
"Pontacyl" Violet RL	—	Poor	Fair
"Pontacyl" Violet 6R	90	Poor	Fair
Du Pont Anthraquinone Blue AB	1075	Fair	Good
Du Pont Anthraquinone Blue B	1054	Poor	Fair
Du Pont Anthraquinone Blue BGA	—	Poor	Fair
Du Pont Anthraquinone Blue 3G	—	Poor	Good
Du Pont Anthraquinone Blue RXO	1076	Poor	Very good
Du Pont Anthraquinone Blue SE	1053	Poor	Good
Du Pont Anthraquinone Blue SKY	1088	Fair	Very good
Du Pont Anthraquinone Blue SWB	—	Fair	Good
Du Pont Anthraquinone Blue SWF	—	Fair	Very good
Du Pont Anthraquinone Blue WSA	—	Poor	Fair
Du Pont Anthraquinone Iris R	1073	Fair	Very good
Du Pont Brilliant Milling Blue B	—	Poor	Good
Du Pont Indigotine O	1180	Poor	Fair
Du Pont Milling Blue G Conc.	—	Poor	Good
Du Pont Silk Blue 10G	—	Good	Very good
Du Pont Silk Fast Blue 3G	—	Fair	Good
Du Pont Soluble Blue G	707	Poor	Fair
Du Pont Soluble Blue R	707	Poor	Fair
"Pontacyl" Blue CBF	—	Poor	Poor
"Pontacyl" Brilliant Blue A	714	Poor	Fair
"Pontacyl" Brilliant Blue 6B	—	Poor	Good
"Pontacyl" Brilliant Blue E	671	Poor	Poor
"Pontacyl" Brilliant Blue G	—	Poor	Good
"Pontacyl" Brilliant Blue RR	—	Poor	Fair
"Pontacyl" Brilliant Blue V	712	Poor	Poor

TABLE #1

ACID COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
"Pontacyl" Fast Blue GB	—	Good	Very good
"Pontacyl" Fast Blue GR	289	Good	Very good
"Pontacyl" Fast Blue 1B	—	Poor	Fair
"Pontacyl" Fast Blue R	208	Poor	Fair
"Pontacyl" Fast Blue SB	209	Poor	Fair
"Pontacyl" Fast Blue 5R	289	Good	Very good
"Pontacyl" Navy Blue M4B	—	Poor	Fair
"Pontacyl" Wool Blue BL	833	Good	Very good
"Pontacyl" Wool Blue GL	833	Good	Very good
Du Pont Anthraquinone Green G	1078	Fair	Good
Du Pont Anthraquinone Green GN	—	Good	Very good
Du Pont Brilliant Milling Green B Conc.	667	Poor	Fair
Du Pont Naphthol Green B Conc.	5	Poor	Poor
"Pontacyl" Brilliant Green 10G	—	Poor	Poor
"Pontacyl" Dark Green B	247	Poor	Fair
"Pontacyl" Green B	666	Poor	Poor
"Pontacyl" Green BL Conc.	666	Poor	Poor
"Pontacyl" Green NV Conc.	735	Poor	Poor
"Pontacyl" Green S	737	Poor	Poor
"Pontacyl" Light Green SF Yellowish	670	Poor	Poor
Du Pont Naphthylamine Black V	318	Fair	Fair
"Pontacyl" Black 8B	—	Poor	Poor
"Pontacyl" Black BX	—	Poor	Poor
"Pontacyl" Black GRF	—	Poor	Poor
"Pontacyl" Black RW	—	Poor	Poor
"Pontacyl" Blue Black AS	246	Poor	Fair
"Pontacyl" Blue Black SX	246	Poor	Fair
"Pontacyl" Fast Black BBN	307	Good	Very good
"Pontacyl" Fast Black BBO	307	Good	Very good
"Pontacyl" Fast Black N2B	—	Good	Very good
Carbolan Yellow 3GS		Good	Very good
Carbolan Crimson BS		Good	Very good
Carbolan Violet 2RS		Good	Very good
Carbolan Blue BS		Good	Very good
Carbolan Blue RS		Good	Very good

Dyeing Method

Neutral		Acid	
	Color		Color
10%	Glauber's salt 1 hr. at 190°F.	10% 3%	Glauber's salt Acetic acid 1 hr. at 190°F.

TABLE #2

CHROME COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
"Pontachrome" Fast Yellow R	—	Fair	Very good
"Pontachrome" Flavine A	219	Poor	Fair
"Pontachrome" Yellow 6G	—	Fair	Good
"Pontachrome" Yellow GR	109	Poor	Good
"Pontachrome" Yellow GS	36	Poor	Fair
"Pontachrome" Yellow 3RN	40	Poor	Fair
"Pontachrome" Yellow SW	—	Poor	Poor
Du Pont Chromate Brown EB	—	Poor	Very good
Du Pont Chromate Brown EBR	—	Poor	Very good
"Pontachrome" Brown G	238	Poor	Fair
"Pontachrome" Brown HN Conc.	—	Poor	Fair
"Pontachrome" Brown MW Powder	101	Poor	Fair
"Pontachrome" Brown PG	—	Poor	Good
"Pontachrome" Brown RH Conc.	—	Poor	Fair
"Pontachrome" Brown SW	—	Poor	Fair
"Pontachrome" Fast Red E	652	Poor	Good
"Pontachrome" Red A4B	431	Poor	Good
"Pontachrome" Red B	216	Poor	Poor
"Pontachrome" Azure Blue BR	720	Poor	Good
"Pontachrome" Blue ECR	722	Poor	Fair
"Pontachrome" Blue R	179	Poor	Fair
"Pontachrome" Blue SW	180	Poor	Fair
"Pontachrome" Blue Green V	292	Good	Good
"Pontachrome" Black A	204	Fair	Good
"Pontachrome" Black B	—	Poor	Poor
"Pontachrome" Black F	299	Fair	Good
"Pontachrome" Black P2B	—	Fair	Fair
"Pontachrome" Black PV	170	Fair	Fair
"Pontachrome" Black SW	—	Fair	Fair
"Pontachrome" Black TA	203	Fair	Good
"Pontachrome" Blue Black BB	201	Fair	Good
"Pontachrome" Blue Black R Conc.	202	Fair	Good

TABLE #2

CHROME COLORS

Dyeing Method

Neutral		Acid	
	Color		Color
10%	Glauber's salt 1 hr. at 190°F.	10% 3%	Glauber's salt Acetic acid 1 hr. at 190°F.

TABLE #3

DIRECT COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
Du Pont Stilbene Yellow G Conc.	620	Poor	Poor
"Pontamine" Fast Yellow BBL	813	Poor	Poor
"Pontamine" Fast Yellow 4GL	—	Poor	Fair
"Pontamine" Fast Yellow 5GL	346	Poor	Fair
"Pontamine" Fast Yellow L2RX	—	Poor	Poor
"Pontamine" Fast Yellow L3RX	—	Poor	Poor
"Pontamine" Fast Yellow NNL	814	Poor	Poor
"Pontamine" Fast Yellow RL	—	Poor	Poor
"Pontamine" Fast Yellow WBF	814	Poor	Poor
"Pontamine" Yellow CG	411	Fair	Fair
"Pontamine" Yellow CH	365	Fair	Good
"Pontamine" Yellow S3G	—	Poor	Poor
"Pontamine" Yellow SX	—	Poor	Poor
"Pontamine" Pure Yellow M	813	Poor	Poor
"Pontamine" Fast Orange EG	—	Poor	Poor
"Pontamine" Fast Orange EGL	—	Poor	Poor
"Pontamine" Fast Orange ERL	—	Poor	Poor
"Pontamine" Fast Orange 2G Conc.	—	Poor	Poor
"Pontamine" Fast Orange 2GL	—	Fair	Fair
"Pontamine" Fast Orange MGL	621	Poor	Poor
"Pontamine" Fast Orange MRL	621	Poor	Poor
"Pontamine" Fast Orange RGL	—	Poor	Poor
"Pontamine" Fast Orange 6R	621	Poor	Poor
"Pontamine" Fast Orange S	326	Poor	Fair
"Pontamine" Fast Orange WS	326	Poor	Fair
"Pontamine" Orange DB	—	Fair	Fair to good
"Pontamine" Orange R	415	Fair	Good
"Pontamine" Orange PG Conc.	653	Fair	Good
Du Pont Rayon Brown G	—	Poor	Good
Du Pont Rayon Brown M	—	Poor	Fair to good
"Pontamine" Brown BCW Conc.	561	Poor	Poor
"Pontamine" Brown BT	561	Poor	Poor
"Pontamine" Brown CG	598	Poor	Fair
"Pontamine" Brown CR	—	Poor	Fair
"Pontamine" Brown D3GN	596	Poor	Fair
"Pontamine" Brown NCR	596	Poor	Fair
"Pontamine" Brown N3G	—	Poor	Fair
"Pontamine" Brown RG	—	Fair	Fair to good
"Pontamine" Brown RMR	420	Poor	Good
"Pontamine" Brown T2G	—	Fair	Fair
"Pontamine" Brown XR	598	Poor	Fair
"Pontamine" Catechu B	—	Poor	Poor
"Pontamine" Catechu GN	—	Fair	Fair
"Pontamine" Catechu G Conc.	—	Fair	Fair
"Pontamine" Catechu 3G	—	Poor	Fair
"Pontamine" Fast Brown BRL	—	Poor	Poor
"Pontamine" Fast Brown 4GL	—	Fair	Fair
"Pontamine" Fast Brown RKL	—	Poor	Fair
"Pontamine" Fast Brown 2RL	—	Poor	Poor
"Pontamine" Fast Brown 4RL	—	Poor	Poor
"Pontamine" Fast Brown SKRL	—	Poor	Fair
"Pontamine" Fast Brown 3YL	—	Fair	Fair to good
Du Pont Geranine GL	—	Poor	Fair
Du Pont Geranine GW	—	Poor	Poor
"Pontamine" Fast Pink BL	353	Poor	Poor
"Pontamine" Fast Pink EB Extra	130	Poor	Fair
"Pontamine" Fast Pink EBN	130	Poor	Fair
"Pontamine" Fast Pink G	—	Poor	Good
"Pontamine" Fast Pink GGN	126	Poor	Fair
"Pontamine" Pink 2B	225	Fair	Good
Du Pont Congo Red	370	Poor	Fair
Du Pont Purpurine 4B	448	Poor	Fair
Du Pont Purpurine 10B	495	Poor	Fair
Du Pont Rayon Bordeaux B	—	Poor	Fair to good
"Pontamine" Bordeaux B	—	Poor	Fair to good
"Pontamine" Fast Bordeaux BL	—	Poor	Poor
"Pontamine" Fast Red 8BL	278	Poor	Fair
"Pontamine" Fast Red 8BNL	—	Poor	Poor
"Pontamine" Fast Red 6BL	—	Poor	Poor
"Pontamine" Fast Red F	419	Fair	Good
"Pontamine" Fast Red FCB	419	Fair	Good

TABLE #3

DIRECT COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
"Pontamine" Fast Rubine B Conc.	—	Poor	Poor
"Pontamine" Fast Scarlet 4BA	326	Poor	Poor
"Pontamine" Fast Scarlet 4BS	326	Poor	Poor
"Pontamine" Fast Scarlet 8BS	326	Poor	Poor
"Pontamine" Fast Scarlet G	326	Poor	Poor
"Pontamine" Garnet R	375	Poor	Fair
"Pontamine" Red 12B Conc.	—	Poor	Good
"Pontamine" Scarlet B	382	Poor	Fair
"Pontamine" Scarlet 6BX	225	Poor	Fair
Du Pont Rayon Violet 3B	—	Poor	Good
"Pontamine" Brilliant Violet B	—	Poor	Good
"Pontamine" Brilliant Violet BN	—	Poor	Poor
"Pontamine" Brilliant Violet RN	387	Poor	Good
"Pontamine" Fast Heliotrope B	—	Poor	Good
"Pontamine" Fast Violet 4BL	—	Poor	Poor
"Pontamine" Violet N	394	Poor	Poor
Du Pont Rayon Navy Blue N	—	Poor	Fair
"Pontamine" Blue AX	502	Poor	Fair
"Pontamine" Blue 3BX	477	Poor	Poor
"Pontamine" Blue BBN	406	Poor	Poor
"Pontamine" Blue BX	472	Poor	Poor
"Pontamine" Blue 3R	464	Poor	Poor
"Pontamine" Blue RW	512	Poor	Poor
"Pontamine" Brilliant Blue G	508	Poor	Poor
"Pontamine" Copper Blue RRX	—	Poor	Poor
"Pontamine" Deep Blue BH Conc.	401	Poor	Poor
"Pontamine" Fast Blue 6G	—	Poor	Poor
"Pontamine" Fast Blue 8GL	—	Poor	Poor
"Pontamine" Fast Blue 4GL	—	Poor	Poor
"Pontamine" Fast Blue 2GL	—	Poor	Poor
"Pontamine" Fast Blue RRL	319	Poor	Poor
"Pontamine" Fast Blue SFL	—	Poor	Poor
"Pontamine" Fast Blue SRL	—	Poor	Poor
"Pontamine" Fast Blue 3GL	—	Poor	Poor
"Pontamine" Fast Turquoise 8GL	—	Poor	Poor
"Pontamine" Navy Blue BF	—	Poor	Poor
"Pontamine" Navy Blue DB	—	Poor	Poor
"Pontamine" Sky Blue 6BX	518	Poor	Poor
"Pontamine" Sky Blue 5BX	520	Poor	Poor
"Pontamine" Sky Blue FF	518	Poor	Poor
"Pontamine" Steel Blue G	590	Poor	Poor
Du Pont Rayon Green 4B	—	Poor	Good
"Pontamine" Fast Green 5BL	—	Poor	Poor
"Pontamine" Fast Green GL	—	Poor	Poor
"Pontamine" Green BX	593	Poor	Fair to good
"Pontamine" Green 2GB Extra	589	Fair	Good
"Pontamine" Green GX	594	Poor	Fair to good
"Pontamine" Green S Conc.	583	Fair	Good
"Pontamine" Green 2Y	—	Poor	Fair
Du Pont Neutral Gray GG	267	Very good	Very good
"Pontamine" Fast Gray B	—	Poor	Fair
"Pontamine" Fast Gray BL	—	Poor	Poor
"Pontamine" Fast Gray 2GL	—	Poor	Poor
Du Pont Rayon Black B	—	Poor	Poor
Du Pont Rayon Black GS	—	Poor	Poor
"Pontamine" Black E	581	Poor	Poor
"Pontamine" Black EBN	581	Poor	Poor
"Pontamine" Black EG Extra	581	Poor	Poor
"Pontamine" Black 3G	581	Poor	Poor
"Pontamine" Black RR	582	Poor	Poor
"Pontamine" Fast Black FF	—	Poor	Poor
"Pontamine" Fast Black GCW	—	Poor	Poor
"Pontamine" Fast Black 2GCW	—	Poor	Poor
"Pontamine" Fast Black L	—	Poor	Fair to good
"Pontamine" Fast Black PG Extra	—	Poor	Poor
"Pontamine" Fast Black PGR	—	Poor	Poor
"Pontamine" Fast Black PGW	—	Poor	Poor

Dyeing Method

Neutral	Acid
Color	Color
10% Glauber's salt	10% Glauber's salt
1 hr. at 190°F.	3% Acetic acid
	1 hr. at 190°F.

TABLE #4

DEVELOPED COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
"Pontamine" Diazo Yellow 4G	—	Poor	Poor
"Pontamine" Diazo Yellow 2GL	—	Poor	Good
"Pontamine" Diazo Yellow GM	—	Poor	Fair to good
"Pontamine" Diazo Orange G	—	Poor	Fair
"Pontamine" Diazo Orange 3G	—	Poor	Fair to good
"Pontamine" Diazo Orange GR	—	Poor	Fair
"Pontamine" Diazo Orange R	—	Poor	Fair
"Pontamine" Diazo Orange RFW	—	Poor	Poor
"Pontamine" Diazo Orange 2R	—	Poor	Poor
"Pontamine" Diazo Orange WD	—	Poor	Fair
"Pontamine" Diazo Brown 6G	—	Poor	Poor
"Pontamine" Diazo Brown R	—	Poor	Poor
Du Pont Primuline Conc.	812	Poor	Poor
"Pontamine" Diazo Bordeaux 7B	—	Poor	Fair
"Pontamine" Diazo Bordeaux 2BL	—	Poor	Poor
"Pontamine" Diazo Bordeaux RB	—	Poor	Fair
"Pontamine" Diazo Scarlet A	—	Fair	Good
"Pontamine" Diazo Scarlet 2BL	—	Poor	Poor
"Pontamine" Diazo Scarlet FW	—	Poor	Poor
"Pontamine" Diazo Scarlet GFW	—	Poor	Poor
"Pontamine" Diazo Scarlet R	—	Poor	Good
"Pontamine" Diazo Violet BL	—	Poor	Poor
"Pontamine" Diazo Violet RR	—	Poor	Poor
"Pontamine" Diazo Blue BR	—	Poor	Poor
"Pontamine" Diazo Blue 3G	—	Poor	Poor
"Pontamine" Diazo Blue 6G	—	Poor	Poor
"Pontamine" Diazo Blue 5GL	—	Poor	Poor
"Pontamine" Diazo Blue NA	317	Poor	Poor
"Pontamine" Diazo Blue 6RN	—	Poor	Poor
"Pontamine" Diazo Green BL	—	Poor	Poor
"Pontamine" Diazo Green 3G	—	Poor	Poor
"Pontamine" Diazo Green 2GL	—	Poor	Poor
"Pontamine" Diazo Green GW	—	Poor	Poor
"Pontamine" Diazo Black BHSW Conc.	401	Poor	Poor
"Pontamine" Diazo Black OB	—	Poor	Poor
"Pontamine" Diazo Black RS	552	Poor	Poor
"Pontamine" Diazo Black ZV Conc.	—	Poor	Poor

Dyeing Method

Neutral	Acid
Color	Color
10% Glauber's salt	10% Glauber's salt
1 hr. at 190°F.	3% Acetic acid
	1 hr. at 190°F.

The colors were developed with the developer customarily used for each individual dyestuff.

TABLE #5

BASIC COLORS

Name of Color	Colour Index Number	Affinity Neutral	Affinity Acid
Du Pont Auramine O	655	Very good	Poor
Du Pont Thioflavine TCN	815	Very good	Poor
Du Pont Basic Orange 3RN	788	Very good	Poor
Du Pont Basic Brown BR	332	Very good	Good
Du Pont Basic Brown GXP	331	Very good	Good
Du Pont Rhodamine B Extra	749	Fair	Fair
Du Pont Rhodamine 6GDN Extra	—	Very good	Fair
Du Pont Fuchsine Conc. Powder	677	Very good	Poor
Du Pont Safranine A	841	Very good	Poor
Du Pont Crystal Violet Extra Pure	681	Good	Fair
Du Pont Ethyl Violet	682	Very good	Fair
Du Pont Methyl Violet NE	680	Very good	Fair
Du Pont Methylene Blue BX	922	Very good	Poor
Du Pont Nile Blue BX	—	Good	Fair
Du Pont Victoria Blue BX	729	Good	Fair
Du Pont Victoria Blue R	728	Very good	Good
Du Pont Victoria Pure Blue BO	—	Very good	Good
Du Pont Brilliant Green Crystals	662	Fair	Fair
Du Pont Victoria Green Small Crystals	657	Fair	Poor
Du Pont Nigrosine WSB Crystals	865	Poor	Poor
Du Pont Nigrosine WSJ Crystals	865	Poor	Poor

TABLE #5

BASIC COLORS

Dyeing Method

Neutral		Acid	
	Color		Color
10%	Glauber's salt	10%	Glauber's salt
	1 hr. at 170°F.	3%	Acetic acid
			1 hr. at 170°F.

TABLE #6

SULFUR COLORS

Name of Color	Colour Index Number	Affinity	Light Fastness
"Sulfogene" Yellow CF	—	Fair to good	Poor
"Sulfogene" Yellow GGCF	955	Fair to good	Fair
"Sulfogene" Orange GCF	—	Poor	
"Sulfogene" Brown CL4R	—	Fair to good	Fair
"Sulfogene" Brown DBR	—	Poor	
"Sulfogene" Brown RBNCF	—	Poor to fair	Poor
"Sulfogene" Cutch CF Conc.	—	Poor	
"Sulfogene" Cutch MCF	—	Poor	
"Sulfogene" Cutch M2RCF	—	Poor	
"Sulfogene" Dark Brown GNCF	—	Poor	
"Sulfogene" Golden Brown GCF	—	Poor to fair	Poor
"Sulfogene" Golden Brown RCF	—	Fair	Poor
"Sulfogene" Olive Drab YCF	—	Poor	
"Sulfogene" Red Brown 6RCF	—	Fair	
"Sulfogene" Tan 2RCF	—	Poor	
"Sulfogene" Bordeaux 5B	1012	Poor	
"Sulfogene" Bordeaux BRN	1012	Poor	
"Sulfogene" Bordeaux 5CF	1012	Poor	
"Sulfogene" Bordeaux CF	1012	Poor	
"Sulfogene" Bordeaux 2RN Conc.	1012	Poor	
"Sulfogene" Violet 2R	—	Poor to fair	Poor
"Sulfogene" Brilliant Blue BGL	961	Fair to good	Poor
"Sulfogene" Brilliant Blue 3GCF	961	Good	Fair
"Sulfogene" Brilliant Blue 5G	—	Fair	
"Sulfogene" Direct Blue BN	956	Fair	
"Sulfogene" Direct Blue BRCF	956	Fair	
"Sulfogene" Direct Blue 2RCF	—	Fair	
"Sulfogene" Navy Blue GL Conc.	959	Fair to good	Poor
"Sulfogene" Navy Blue GLR Conc.	959	Fair	Poor
"Sulfogene" Navy Blue RL Conc.	959	Fair to good	Poor
"Sulfogene" Navy Blue 4RCF	959	Fair to good	Poor
"Sulfogene" Brilliant Green 2G	1006	Poor to fair	Poor
"Sulfogene" Brilliant Green GCF	1006	Poor to fair	Poor
"Sulfogene" Brilliant Green 4GX	1006	Poor to fair	Poor
"Sulfogene" Fast Green BCFN	—	Poor	
"Sulfogene" Fast Green YCF	—	Poor	
"Sulfogene" Green M Conc.	1006	Poor	
"Sulfogene" Olive GNCF	—	Poor	
"Sulfogene" Olive RN	—	Poor	
"Sulfogene" Gray H	978	Poor	
"Sulfogene" Carbon 2BCF Grains	—	Good	Fair
"Sulfogene" Carbon 4GCF Grains	—	Poor	
"Sulfogene" Carbon 8GCF Grains	—	Poor	
"Sulfogene" Carbon HCF Grains	—	Poor	
"Sulfogene" Carbon MCF Grains	—	Poor	
"Sulfogene" Carbon 4RCF Grains	—	Poor	
"Sulfogene" Carbon Supra CF Grains	—	Poor	
"Sulfogene" Fast Black NCL	—	Poor	

Dyeing Method

	Color
2 - 10%	Sodium sulfide
2 - 5%	Soda ash
30 - 50%	Common salt
	1 hr. at 180°F.

TABLE #7

VAT COLORS

Name of Color	Colour Index Number	Affinity
Du Pont Vat Yellow 8G Double Paste	—	Poor
"Ponsol" Brilliant Yellow 4G Double Paste	—	Poor
"Ponsol" Flavone GC Paste	—	Fair
"Ponsol" Yellow AR Double Paste	1132	Poor
"Ponsol" Yellow FG Double Paste	—	Poor
"Ponsol" Yellow G Paste	1118	Poor
"Ponsol" Yellow GGK Paste	—	Fair
"Sulfanthrene" Yellow R Paste	1170	Poor
"Ponsol" Golden Orange G Paste	1096	Fair
"Ponsol" Golden Orange RRG Paste	—	Fair
"Ponsol" Golden Orange 4R Paste	1098	Fair
"Ponsol" Golden Orange RRT Paste	1097	Fair
"Ponsol" Orange RC Paste	1169	Poor
"Sulfanthrene" Orange R Paste	1217	Fair
"Ponsol" Brown AG Paste	—	Poor
"Ponsol" Brown AR Paste	1151	Poor
"Ponsol" Brown BB Paste	1120	Poor
"Ponsol" Brown 2G Paste	—	Poor
"Ponsol" Brown VR Paste	—	Poor
"Ponsol" Dark Brown R Paste	—	Poor
"Ponsol" Khaki 2G Paste	—	Poor
"Sulfanthrene" Brown GC Paste	—	Fair
"Ponsol" Pink B Double Paste	—	Poor
"Sulfanthrene" Pink BG Paste	—	Poor
"Sulfanthrene" Pink FB Paste	—	Fair
"Sulfanthrene" Pink FF Paste	—	Fair
"Ponsol" Red AFF Double Paste	1133	Poor
"Ponsol" Red BN Paste	1162	Poor
"Ponsol" Red G2B Double Paste	—	Poor
"Sulfanthrene" Red 3B Paste	1212	Fair
"Sulfanthrene" Scarlet 2BN Paste	—	Fair
"Sulfanthrene" Scarlet G Paste	—	Fair
"Sulfanthrene" Scarlet 2G Paste	—	Fair
"Sulfanthrene" Scarlet Y Paste	1228	Fair
"Ponsol" Brilliant Violet 4RN Paste	—	Fair
"Ponsol" Red Violet RRNX Paste	1161	Poor
"Ponsol" Violet ABB Paste	1134	Poor
"Ponsol" Violet AR Paste	1135	Poor
"Ponsol" Violet BN Supra	1163	Poor
"Ponsol" Violet RR Double Powder	1104	Fair
"Sulfanthrene" Red Violet 2RN Paste	—	Fair
"Ponsol" Blue BCL Double Paste	—	Poor
"Ponsol" Blue BCS Double Paste	1114	Poor
"Ponsol" Blue BF Double Paste	—	Poor
"Ponsol" Blue GD Double Paste	1113	Poor
"Ponsol" Blue 3G Paste	1109	Poor
"Ponsol" Blue RCX Paste	—	Poor
"Ponsol" Blue RS Paste	1106	Poor
"Ponsol" Brilliant Blue R Paste	1106	Poor
"Ponsol" Dark Blue BOA Paste	1099	Poor
"Ponsol" Dark Blue BR Paste	1099	Poor
"Ponsol" Navy Blue Double Paste	—	Poor
"Ponsol" Navy Blue RA Double Paste	—	Poor
"Ponsol" Blue 5G Paste	—	Poor
"Sulfanthrene" Blue 2BD Paste	1184	Fair
"Sulfanthrene" Blue G Paste	971	Poor
"Sulfanthrene" Blue GR Paste	969	Poor
"Ponsol" Blue Green FFB Double Paste	—	Poor
"Ponsol" Blue Green Y Double Paste	—	Fair
"Ponsol" Brilliant Green 2G Paste	—	Poor to fair
"Ponsol" Brilliant Green 4G Paste	—	Poor to fair
"Ponsol" Green B Double Paste	1102	Poor
"Ponsol" Green 2BX Paste	—	Poor
"Ponsol" Green RC Paste	—	Poor
"Ponsol" Jade Green Supra	1101	Poor to fair
"Ponsol" Olive AR Double Paste	1150	Poor
"Ponsol" Olive G Double Paste	—	Poor
"Ponsol" Black BA Double Paste	1102	Poor
"Ponsol" Black BN Double Paste	1102	Poor
"Ponsol" Direct Black 3G Double Paste	—	Poor
"Sulfanthrene" Black PG Double Paste	—	Poor

The vat colors were applied by the method ordinarily used for each individual color in the dyeing of pure silk.

TABLE #8

"ACETAMINE" AND "CELANTHRENE" COLORS ON NYLON

Name of Color	Absorption Rate	Light L	Light M	Washing 120°F. L	Washing 120°F. M	Perspiration Acid L	Perspiration Acid M	Perspiration Alkaline L	Perspiration Alkaline M	Hot Moist Pressing 200°C. L	Hot Moist Pressing 200°C. M	Hot Moist Pressing 130°C. L	Hot Moist Pressing 130°C. M	Shade Comparison with Acetate
"Acetamine" Yellow CG	R	5	5-6	5	4	5	4	5	4	5	4	5	5	Redder
"Acetamine" Yellow 3G	M	3-4	3-4	4	4	3	3	3	3	5	4	5	4	Redder
"Acetamine" Yellow 5G	R	3-4	3-4	4	3	3	3	3	3	4	3	4	4	Similar
"Celanthrene" Fast Yellow GL	S	3-4	3-4	5	4	3	3	3	3	4	4	5	5	Similar
"Acetamine" Orange GR	R	5	6	5	4	4	4	4	4	4	3	5	4	Much redder
"Acetamine" Orange PR	R	3-4	4	4	3	3	3	3	3	4	3	5	4	Much redder
"Acetamine" Orange 2R	R	3-4	4	4	3	4	4	4	4	4	3	5	4	Redder
"Acetamine" Orange 3R	M	3-4	4	5	4	3	3	4	4	4	3	5	4	Very much redder
"Acetamine" Red CR	M	3-4	4	4	3	3	3	3	3	4	4	5	4	Much bluer
"Acetamine" Red RP	M	3-4	4	5	4	3	3	3	3	4	4	5	5	Much bluer
"Acetamine" Rubine B	M	3-4	4	5	4	3	3	3	3	4	3	5	5	Bluer
"Acetamine" Scarlet B	M	4	5	5	4	4	4	4	4	4	4	5	4	Much bluer
"Celanthrene" Brilliant Red	S	4	5-6	5	4	4	4	4	4	3	2	4	3	Very much bluer
"Celanthrene" Red Y	S	3	4	5	4	4	4	4	4	3	2	4	3	Very much bluer
"Acetamine" Violet 2R	S	3	4	5	4	4	4	4	4	4	4	4	4	Much bluer
"Celanthrene" Fast Violet BL	M	5	5-6	5	4	4	3	4	3	4	3	5	4	Much bluer
"Celanthrene" Purple	VR	5	5-6	5	4	4	4	4	4	4	4	5	5	Bluer
"Celanthrene" Red Violet R	VR	5	5-6	5	4	4	4	4	4	4	4	5	4	Much bluer
"Celanthrene" Violet CB	R	5	5-6	5	4	4	3	4	4	4	3	5	4	Slightly bluer
"Acetamine" Diazo Navy RD*	M	3-4	3-4	5	5	5	5	4-5	4-5	5	5	5	5	Similar
"Celanthrene" Brilliant Blue FFS	M	4	5	5	4	4	3	4	3	4	3	5	4	Similar
"Celanthrene" Brilliant Blue 2G	S	4	5	5	4	4	3	4	3	4	3	5	4	Similar
"Celanthrene" Navy Blue BP Conc.	R	4	5	5	4	4	4	4	4	4	4	5	5	Similar
"Celanthrene" Pure Blue BR	R	4	5	5	4	4	4	4	4	4	4	5	5	Similar
"Acetamine" Diazo Black 3B*	R	4-5		5	5	5	5	4-5	4-5	4		5		Duller
"Acetamine" Diazo Black GFS*	R	4-5		5	5	5	5	4-5	4-5	4		5		Duller

*Developed with "Acetamine" Developer AD Extra.

Dyeing Method

Color
1-2% "Modinal" ES Paste
1 hr. at 180-190°F.

NOTE: In Table No. 8, the medium shade light rating given for "Acetamine" Yellow CG should read 6 instead of 5-6. The light shade and medium shade light rating for "Acetamine" Orange GR should read 4 and 5 instead of 5 and 6.

TABLE #9

FASTNESS PROPERTIES OF ACID DYESTUFFS ON NYLON SELECTED ON THE BASIS OF AFFINITY

Name of Color	Light L	Light M	Washing 120°F. L	Washing 120°F. M	Washing 180°F. L	Washing 180°F. M	Perspiration Acid L	Perspiration Acid M	Perspiration Alkaline L	Perspiration Alkaline M	Fulling 120°F. L	Fulling 120°F. M	Hot Moist Pressing 200°C. L	Hot Moist Pressing 200°C. M	Hot Moist Pressing 130°C. L	Hot Moist Pressing 130°C. M
Du Pont Azo Yellow Conc.	2	2	5	4	4	2-3	4-5	2-3	2-3	2-3	2	2	3	2	4	3
Du Pont Metanil Yellow Conc.	5	6	5	5	3	2	5	5	5	3	4	3	5	4	5	5
Du Pont Milling Yellow G	5	6	5	5	5	4	5	5	5	5	5	4	5	5	5	5
Du Pont Milling Yellow 3G Conc.	5	6	5	4	5	4	5	4	5	4	5	4	5	2	5	3
Du Pont Milling Yellow 5G Conc.	5	6-7	5	4	4	4	5	4	5	4	5	3	5	3	5	4
Du Pont Milling Yellow R Conc.	5	6-7	5	5	5	4	5	5	5	5	5	5	5	3	5	4
Du Pont Neutral Yellow GS	2	2	5	5	5	5	5	5	5	5	5	4	5	4	5	5
Du Pont Milling Orange R Conc.	5	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5
Du Pont Neutral Brown 2RS	2-3	2-3	5	4	5	3	5	5	5	5	5	3	4	3	4	4
Du Pont Milling Red 3B Conc.	4	5	5	5	5	4	5	5	5	5	5	4	5	4	5	5
Du Pont Milling Red R Conc.	5	6	5	5	5	4	5	5	5	5	5	4	5	4	5	5
Du Pont Milling Red SWB	5	5-6	5	5	5	4	5	5	5	5	5	5	5	5	5	5
Du Pont Milling Red SWG	5	5-6	5	5	5	4	5	5	5	5	5	5	5	5	5	5
Du Pont Silk Red BW Conc.	3-4	3-4	5	5	5	3	5	5	5	5	5	4	5	5	5	5
"Pontacyl" Fast Red AS	2	2	5	4	4	2	5	5	5	5	5	4	4	3	4	4
"Pontacyl" Ruby PL Conc.	2	2	5	5	4	2	5	5	5	5	4	3	5	4	5	5
Du Pont Anthraquinone Violet 3R	6-7	6-7	5	5	5	4	5	5	5	5	5	4	5	4	5	4
Du Pont Anthraquinone Blue SKY	6	6-7	5	4	4	3	5	5	5	4	4	3	5	4	5	4
Du Pont Anthraquinone Blue SWF	6	6	5	4	4	3	5	5	5	4	4	3	5	4	5	4
Du Pont Anthraquinone Iris R	5	6	5	4	4	3	5	5	5	4	4	3	5	4	5	4
Du Pont Silk Blue 10G	4	4	5	4	4	3	4	4	4	3	4	3	5	4	5	4
"Pontacyl" Fast Blue GB	5	6	5	5	5	4	5	4	4	4	5	4	5	4	5	4
"Pontacyl" Fast Blue GR	5	6	5	5	5	4	5	4	4	4	5	4	5	4	5	4
"Pontacyl" Fast Blue 5R	5	6	5	5	5	4	5	4	4	4	5	4	5	4	5	4
"Pontacyl" Wool Blue BL	2	2	5	4	4	3	4	4	4	4	5	4	4	4	4	4
"Pontacyl" Wool Blue GL	2	2	5	4	4	3	4	4	4	4	5	4	4	4	4	4
Du Pont Anthraquinone Green GN	6	6-7	5	5	5	4	5	4	5	4	5	4	5	4	5	5
"Pontacyl" Fast Black BBN	4	5-6	5	5	5	4	5	5	5	5	5	4	5	4	5	5
"Pontacyl" Fast Black BBO	4	5-6	5	5	5	4	5	5	5	5	5	4	5	4	5	5
"Pontacyl" Fast Black N2B	4	5-6	5	5	5	4	5	5	5	5	5	4	5	4	5	5
Carbolan Yellow 3GS	5	5-6	5	5	5	4	5	5	5	5	5	5	5	4	5	5
Carbolan Crimson BS	5	5-6	5	4	4	3	5	4	5	3	5	5	3	2	3	2
Carbolan Blue BS	6	6-7	5	4	4	3	5	5	5	4	5	3	3	2	3	2
Carbolan Blue RS	6	6-7	5	4	4	3	5	5	5	4	5	5	3	2	4	3
Carbolan Violet 2RS	5	6	5	4	4	3	5	5	5	4	5	5	4	3	5	4

TABLE #10

FASTNESS PROPERTIES OF CHROME COLORS ON NYLON YARN

Name of Color	Washing 180° F.	Fulling	Hot Moist Pressing 200° C.	Light
"Pontachrome" Fast Yellow R	5	5	5	6-7
"Pontachrome" Yellow 6G	4-5	4-5	4	6-7
"Pontachrome" Yellow GR	5	5	5	4-5
"Pontachrome" Yellow GS	3-4	3	4	5-6
"Pontachrome" Yellow 3RN	2-3	2-3	2	5-6
Du Pont Chromate Brown EB	4	4	5	4-5
Du Pont Chromate Brown EBR	4	4	5	4-5
"Pontachrome" Brown HN Conc.	5	5	5	4-5
"Pontachrome" Brown PG	5	5	5	4
"Pontachrome" Brown RH Conc.	5	5	5	4-5
"Pontachrome" Red A4B	3-4	3-4	5	5
"Pontachrome" Azure Blue B	5	5	5	4
"Pontachrome" Blue ECR	5	5	5	4-5
"Pontachrome" Blue Green V	4-5	4-5	5	5
"Pontachrome" Black F	5	5	5	7
"Pontachrome" Black TA	5	5	5	6-7
"Pontachrome" Blue Black BB	4	4	5	4-5
"Pontachrome" Blue Black R Conc.	3-4	3-4	5	4-5

Dyeing Method

Color		
20%	Glauber's salt	20 minutes at 190-200°F.
5%	Acetic acid	30 minutes at 190-200°F.
2%	Formic acid	30 minutes at 190-200°F.
2-4%	Chrome	45 minutes at 190-200°F.

TABLE #11

DYESTUFFS FOR COTTON AND RAYON LEAVING NYLON CLEAR FROM A NEUTRAL BATH

"Pontamine" Fast Yellow RL
"Pontamine" Yellow SX

"Pontamine" Fast Orange EGL
"Pontamine" Fast Orange ERL
"Pontamine" Fast Orange WS

"Pontamine" Fast Pink BL

"Pontamine" Fast Bordeaux BL
"Pontamine" Fast Red 6BL
"Pontamine" Fast Rubine B Conc.
"Pontamine" Fast Scarlet 4BA
"Pontamine" Fast Scarlet 8BS
"Pontamine" Fast Scarlet G

"Pontamine" Fast Violet 4BL

"Pontamine" Blue BBN
"Pontamine" Brilliant Blue G
"Pontamine" Fast Blue 4GL
"Pontamine" Fast Blue RRL
"Pontamine" Fast Blue SFL
"Pontamine" Sky Blue 6BX
"Pontamine" Sky Blue 5BX

"Pontamine" Fast Green 5BL
"Pontamine" Fast Green GL

"Pontamine" Fast Gray BL
"Pontamine" Fast Gray 2GL

"Pontamine" Diazo Black BHSW Conc. (dyed direct)
"Pontamine" Fast Black PG Extra

Dyeing Method

Color	
½%	Soap
10-20%	Glauber's salt
	1 hour at 190-200°F.

A New Oxidizing Agent

for the Treatment of Textiles*

A. L. DUBEAU, J. D. MacMAHON and G. P. VINCENT**

IF someone had stood before a meeting of this association only two years ago and said, "I am going to tell you about an oxidizing agent which, in spite of the fact that it contains chlorine in the form of available chlorine, will bleach cellulosic material on the acid side even at a boiling temperature with no degrading action on the cellulose," there is a strong likelihood that such a statement would have been unanimously denounced or, at least, generally greeted with considerable skepticism. Yet today several New England finishing plants are using such a product in this way and have found that it not only has no deleterious effect on cotton and rayon and acetate rayon, but that it also has other definite advantages over the commonly used alkaline processes for certain types of fabrics. The product that has been responsible for this radical departure from some of the customary mill practices is now becoming increasingly known under the trade name, Textone.

It is an oxidizing agent containing upwards of 80 per cent sodium chlorite having the chemical formula, $NaClO_2$ and although it differs from the active agent in chemic, sodium hypochlorite, only by the addition of one more atom of oxygen in the molecule, their properties are surprisingly dissimilar. Although the oxidizing value of Textone, when calculated as available chlorine, is approximately 130 per cent, unlike sodium hypochlorite, it liberates chlorine dioxide (ClO_2) when acidified rather than free chlorine whose destructive action on cellulose

*Presented at Annual Meeting, Boston, Mass., Sept. 15, 1939.
**The Mathieson Alkali Works, Inc.

(1)	5 Na ClO_2 (Sodium) (Chlorite)	+	4 HCl (Muriatic) (Acid)	→4 ClO_2 (Chlorine) (Dioxide)	+	5 NaCl (Sodium) (Chloride)	+	2 H_2O (water)
(2)	NaClO (Sodium) (Hypochlorite)	+	2 HCl (Muriatic) (Acid)	→Cl_2 (Chlorine)	+	NaCl (Sodium) (Chloride)	+	H_2O (water)

is only too well known. The equations above show how different these two oxidizing agents react when strongly acidified.

The activity of a bleach bath containing Textone is determined by the rate at which chlorine dioxide is liberated which increases with (1) a decrease in the pH value of the solution, (2) an increase in the temperature of the bath and (3) an increase in the concentration of Textone in solution. It has, however, been definitely established that even a boiling solution at a pH value of 3.0 having a concentration of Textone far in excess of anything commercially practicable produces no significant degradation of cellulose even after prolonged treatment. Any attack on the cellulose resulting from a further reduction in the pH value of the solution can be almost entirely attributed to the effect of excessive acidity rather than the oxidizing action of the Textone. For example, when cotton or rayon is boiled in a strongly acidified solution there is very little difference in the degree of degradation whether or not Textone is present in the solution. Since the metals commonly used in the construction of equipment in the textile finishing mill have no catalyzing action on acidified Textone, any danger of tendering from this source is removed and in this respect it is also unique among the bleaching agents now commonly used in the textile industry. Another important property of Textone, as it is shipped in the dry form to the consumer, is its extremely high degree of stability since it loses practically none of its available chlorine during prolonged periods of storage even under excessive summer temperatures.

The ability to bleach with safety on the acid side at elevated temperatures has resulted in a method of operation which simplifies and shortens the time of preparation of a good many fabrics now being handled in Rodney-Hunt machines, becks and other equipment of similar design and purpose. This involves the use of one of the so-called synthetic detergents which is added to the Textone bath, thus permitting scouring and bleaching to be carried on simultaneously in a single step. The essential property demanded of the synthetic detergent is that it shall not lose its detergent properties in a hot, oxidizing, acid medium but since many of them comply with this requirement the flexibility of the process is not at all limited in this respect.

Considerable yardages of spun rayon are now being regularly processed by methods employing these essential features. One of the large finishing mills in the New England area is preparing this type of fabric in a dye-beck using substantially the following procedure: A load of greige spun rayon is given a 45 minute scour at a temperature of 180-190° F. using the following for each 1,000 yds. of cloth in the machine:

Textone—1½ lbs.
Synthetic detergent—1 lb.
Acetic acid (28%)—4 qts.

At the end of this time the liquor is dropped and the load given a hot and then a cold water wash. This single step process results in a satisfactory white and excellent dyeing characteristics. If a full bleach is not required the degree of bleaching can be controlled by the amount of Textone and acid used, but regardless of the resulting white, spun rayon so prepared is fully "bottomed" and dyes up evenly. When the fabric contains a gelatinous size it is advisable to remove it with a hot water wash prior to the Textone treatment to prevent an accumulation of coagulated sizing in this bath. Malting prior to the Textone operation is sometimes desirable where the fabric has a starch sizing.

The process also lends itself to continuous operation by either running two or more machines in tandem or utilizing a single machine subdivided into compartments. One mill is scouring all their spun rayon by running continuously through a single one tank machine which permits only a 20 minute retention. In any continuous process it is, of course, necessary to periodically adjust the Textone and detergent concentration, also the acidity of the bath and it is the usual practice to add about one pound of Textone, ½ lb. of detergent and one quart of 28 per cent acetic acid for each 1,000 yards processed and to dump the bath and prepare a fresh solution after 15,000 yards have been run. The initial bath and subsequent replacements are usually prepared by adding the following for each 100 gallons of solution, the amount depending upon the length of time the fabric is retained in the machine and the degree of bleaching required:

Textone—1/3 to 1 lb.
Synthetic detergent—¼ to ¾ lb.
Acetic acid (28% or equivalent)—8 oz. to 1 quart.

The following claims have been made for this process by those who are operating it on spun rayons comparing it with methods previously used:

(1) Lower costs.
(2) Shorter time.
(3) Better whites.
(4) Fewer dyeing faults.
(5) Fewer structural faults.

Variations in the quality of spun rayon fabrics and wide

differences in mill methods make it quite unlikely that every finishing plant will experience all these advantages.

Pigmented rayon fabrics respond readily to a Textone treatment and it is now being used quite extensively on materials of this type. The methods used are quite similar to those for spun rayon but in general require smaller amounts of Textone and acid per yard of fabric or less time to produce good whites or satisfactory dyeing properties. The claims that are made for the acid Textone-Synthetic detergent "prepare" for spun rayons also cover the experiences with the pigmented rayon fabrics. The one that is voiced perhaps most frequently is its ability to promote better dyeing, both as to reliability and quality.

Since cellulose acetate rayon is easily damaged by both alkali and chemic, the use of Textone offers a safe means of scouring and bleaching this unusually reactive fiber. Saponification of the acetyl groups by the action of alkali and the yellowing effect imparted by the action of the chemic are entirely removed by keeping the "prepare" on the acid side which the use of a combination of Textone and synthetic detergent permits. In handling knitted wear, however, a mild alkali soaping may precede the Textone bleach to remove the knitting oils.

Other fabrics that have been successfully scoured and bleached by this method, but in a more limited way, include cotton and filament rayon mixtures such as corset cloth and draperies, spun rayon mixtures, velveteens and laces. Sufficient work has also been done on a commercial scale of operation to establish the practicability of using an acid Textone bleach on boiled cotton yarn for thread where increasing importance is attached to the ability of this method to bleach without inviting tendering and harshness.

The extent of the scope of its application in textile finishing operations is well illustrated by the fact that advantage is also taken of the slow oxidizing action of Textone on the extreme alkaline side to use it in kiering solutions. Under kiering conditions it exerts an effective desizing action on the load and otherwise promotes an even circulation through the load. For this use, from 1 to 2 pounds of Textone for each 1,000 lbs. of goods is added to the caustic make-up tank, the amount depending upon the type of goods in the load, the efficiency of the kier and the purpose for which the Textone is intended. No changes in the operation of the kier are necessary. The mild oxidizing action of Textone in a caustic soda solution has no tendering effect on cotton and does not corrode the kier even at pressure temperatures. Operations on a commercial scale have shown that the use of Textone in this way has accomplished the following:

1. Elimination of a greige sour prior to kiering.
2. Elimination of malting prior to kiering.
3. If the pretreatment includes both malting and souring it is unlikely that both may be eliminated to advantage.
4. Elimination of a second boil where this practice is used to obtain uniformity.
5. Although Textone on the highly alkaline side does no bleaching, its action in the kier aids the subsequent bleaching step. Often this allows chemic concentration to be reduced.
6. A more even prepare is obtained, thus better dyeing and more permanent whites can be expected.

The limited time necessarily imposed upon the presentation of this paper has restricted it to a rather broad description of the development work accomplished up to this time in applying this unique material to textile finishing problems. It is hoped, however, that its contents is sufficiently informative to at least suggest to those present that a product having the characteristics here described offers distinct possibilities of improving some of their own mill practices.

Electrophoretic Studies of Wool*

ARNOLD M. SOOKNE and MILTON HARRIS**

EDITORIAL ABSTRACT

A new investigation of the electrophoretic properties of wool shows that phthalate ion, used in buffers in earlier work, exhibits a specific ion effect, and shifts the isoelectric point to lower pH values. In acetate buffers, the isoelectric point of wool scales and cortical cells was found to be at pH 4.5. Samples of ground or powdered wool show an isoelectric point at pH 4.2. Much of the confusion which exists concerning the location of the isoelectric point has arisen from the assumption that the isoionic and isoelectric points are identical. The significance of both of these points in wool processing is discussed.

I. INTRODUCTION

THE electrophoretic technique has been used for distinguishing protein surfaces[1, 2, 3], and as a means of determining one of the characteristic constants of a protein, namely, the isoelectric point.

Considerable disagreement appears to exist concerning the pH at which wool is isoelectric, and the significance of the isoelectric point in wool processing. The chief difficulty arises from the fact that some of the values have been determined by methods which do not necessarily define isoelectric points. In the present paper an attempt is made to clarify this situation. In addition, the results of a new investigation of the electrophoretic properties of wool are presented.

As defined by Abramson[1], the isoelectric state of a surface is that electrical state in which the sum of the positive and negative charges at the surface over a time average is equal to zero. The *isoelectric point* then is defined as the reference concentration of hydrogen ion or some other ion (Th++++, for example) at which this condition is found; i.e., the condition at which the electrical mobility is zero. Although it has become customary to define the isoelectric point in terms of the pH scale, it must be defined in terms which include a complete description of the medium in which no migration takes place.

The *isoionic point* is defined as the point at which dissociable groups of the substance combine equally and only with hydrogen and hydroxyl ions[6]. This is identical with the isoelectric point only when the substance does not combine with ions other than hydrogen or hydroxyl. It follows then that while it may be possible to determine the isoelectric point by several methods, as by titration, providing the substance combines with only hydrogen or hydroxyl ions, only an electrokinetic method can determine the isoelectric point in every case. The isoionic and isoelectric points of some soluble proteins have been found to be approximately the same. However, in the case of the insoluble materials, especially those which are more or less crystalline in nature, the isoelectric and isoionic points may be far apart. This is true of crystals of even relatively simple substances such as amino acids[8]. It has been suggested that in addition to the amphoteric properties at the surface, negative ions are also adsorbed at the surface resulting in a shift of the isoelectric point to lower pH values.

Values for the isoelectric point of wool obtained by a number of investigators are reviewed by Speakman and Stott[4], and for that reason need not be given here. The important fact which should be emphasized is that with the exception of Harris' earlier value[5], practically all of the values were based either directly or indirectly on determinations of the amount of hydrogen or hydroxyl ion bound by the fiber. The assumption was made that the isoelectric state of a substance is dependent only on the state of its dissociable acid and basic groups (its combination with hydrogen or hydroxyl ions), that the isoionic and isoelectric points are necessarily identical. This probably accounts for the discrepancy pointed out by Speakman and Stott[4] between the figures pH 5 and pH 3.4 for the "isoelectric" point of wool. The former was determined by titration, and may therefore be considered as the isoionic point.† The latter was determined by electrophoresis, and is therefore the isoelectric point in phthalate buffers. (See below for values in acetate buffers.) Speakman[9] explains the low value determined by electrophoresis as being caused by the presence of —NH— groups on the surface of the wool. While we agree that the low value is due to a surface phenomenon, it is hard to see how the kind of groups he postulates could cause a lowering rather than a raising of the pH value at which the wool is isoelectric.

II. MATERIALS AND METHODS

Studies of the electrophoretic properties of wool are complicated by the fact that the fibers have a complex morphological structure. In the present investigation an attempt was made to study the component parts of the fiber. Measurements were made on cortical cells, scales, and what is assumed to be the intracellular substance. The scales were obtained by passing wool fibers through a Koerner grinder[10]. This machine produces very little

*This is the third publication of the new research program of the Textile Foundation at the National Bureau of Standards.

**Research Associates at the National Bureau of Standards, representing the Textile Foundation, Inc.

†In an investigation now in progress in this laboratory, it has been found that the point at which combination with acid begins is near pH 6.4[7].

cutting action since the blades are about 1/16" apart. Microscopic examination of fibers so treated indicated considerable descaling, but the bulk of the fibers appeared to be uncut. Examination of the particles removed from the fibers showed them to be plate-like and about 2 microns in size.

Cortical cells were obtained by retting fibers with bacteria, and also from the dust in a carpet wear-testing machine* in which the fibers are broken down by mechanical action.

Fibers were also reduced to a convenient particle size by grinding in a laboratory Wiley mill or in a pebble mill. When the former was used, the wool was ground until it passed through a 60 mesh screen. The powder was suspended in water, the larger particles allowed to settle, and the particles (1 to 5 microns) remaining in the supernatant liquid were used for the measurements. Both methods of grinding destroyed the cell structure and presumably exposed the intracellular substance.

For the measurement of the electric mobility of ground wool particles, an Abramson horizontal microelectrophoresis cell was employed. The apparatus and methods were essentially the same as those described by Moyer[12]. The apparatus was checked from time to time by measuring the mobility of human erythrocytes in $M/15$ phosphate buffer at pH 7.4[13]. Either a 20x ocular and 20x objective or a 28x ocular and 40x water-immersion objective were used.

The mobilities of cortical cells of wool were measured in a vertical microelectrophoresis cell, similar to that described by Abramson, Moyer, and Voet[14], since the rapid settling of these large particles made the use of the horizontal cell impossible. In the vertical cell, the particle settles in the plane of observation, and remains in the same electroosmotic level throughout the measurement. The electric mobility of the particle is the mean of its velocities over a given distance in both directions. The effect of gravitational fall is thus eliminated. When the electric mobility is large compared to the velocity of gravitational fall, the distance travelled in one direction, divided by the mean of the times of transit with the current in both directions gives substantially the same result. In extreme cases (e.g., in the immediate neighborhood of the isoelectric point) the electric mobility is very small compared to the gravitational fall, and reversal of the current may even fail to reverse the direction of motion of the particle.

Measurements were made in a constant temperature room at 25° C. to avoid convection currents caused by temperature differences. With solutions of ionic strength as low as 0.02 M, convection currents were caused by leaving the current on for even relatively short periods when the vertical cell was used. For this reason, all measurements in the vertical cell were made in solutions of 0.005 M ionic strength, and the current was left on for as short a time as possible. The 20x ocular and 20x objective were used for all measurements in the vertical cell. The cell was checked against the horizontal cell by measuring identical suspensions of wool in both cells. In general the vertical cell was found more difficult to use, and required more time for a measurement than the horizontal cell, which is well adapted to measurement of the mobilities of small particles.

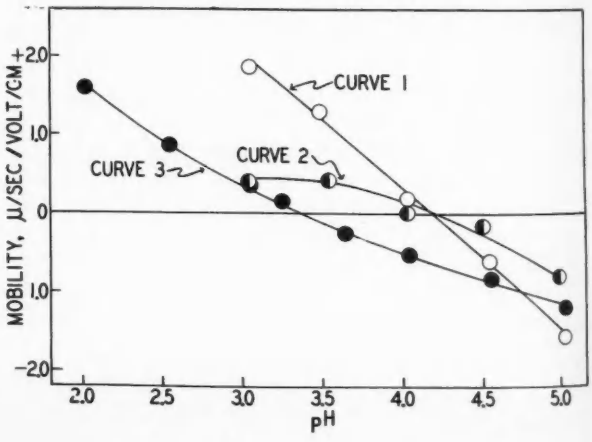
pH values of the suspensions were measured with a MacInnes and Belcher type glass electrode and a vacuum-tube potentiometer, using a cathode-ray tube as null indicator. The pH values were referred to potassium acid phthalate 0.05 M, which was assigned a pH value of 4.01[15].

III. EXPERIMENTS AND DISCUSSION

(1) Effect of Buffers on the Electrophoretic Properties of Wool

In a recent investigation relating to the electrophoretic properties of silk[16], large ions of complex structure, such as phthalate or picrate, appeared to have specific effects which produced appreciable shifts in the pH-mobility curves. Since phthalate buffers were used in the earlier work by Harris on the isoelectric point of wool, a reinvestigation of the electrophoretic properties of wool fibers was undertaken. The results shown in Figure 1 were obtained on wool fibers ground in the laboratory Wiley mill. Curve 3 is the pH-mobility curve for wool in phthalate buffers and shows an isoelectric point at pH 3.4, in agreement with the earlier value of Harris'. Curve 1 is a pH-mobility curve for the same sample in acetic acid-sodium acetate buffers of 0.005 M *ionic strength*. Under these conditions the sample is isoelectric at pH 4.2, a shift of approximately 0.8 pH unit. This shift is of the same

Figure 1. The electrophoretic mobility in different buffer solutions of wool ground in a Wiley mill. Curve 1, 0.005 M ionic strength acetic acid-sodium acetate solutions. Curve 2, 0.1 M ionic strength acetic acid-sodium acetate solutions. Curve 3, Clark's phthalate buffers.



*The cells were obtained from a sample of undyed carpet which was subjected to a wear test on the Shawmut carpet testing machine. The disintegration of fibers under these conditions into cells has been reported by Schiefer and Cleveland[11].

order of magnitude as that obtained for silk. Curve 2 shows the results for the same sample in acetic acid-sodium acetate buffers of 0.1 *M* ionic strength, and shows that the shift in isoelectric point caused by the use of phthalate buffers is not the result of increased ionic strength, but has resulted from a specific ion effect.

(2) Electrophoretic Properties of Cortical Cells and Scales

Figure 2 shows the mobility as a function of pH in 0.005 *M* acetic acid-sodium acetate buffers for three different samples of cortical cells and one sample of scales. One sample of the cells was prepared by the mechanical action of the carpet tester on wool. The other samples were prepared by retting of the fibers with bacteria for periods of 4 and 14 months. The scales were obtained by subjecting wool fibers to the action of a Koerner grinder as previously described.

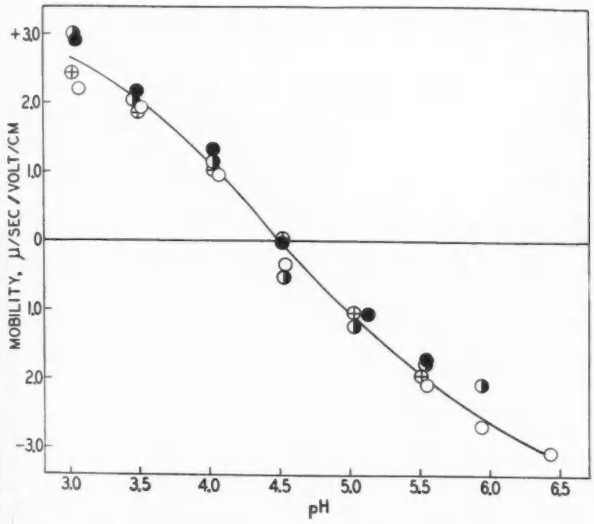


Figure 2. A comparison of the pH-mobility curves of wool scales and three different samples of cortical cells in acetic acid—sodium acetate solutions of 0.005 *M* ionic strength. Scales prepared by grinding wool in Koerner machine, ⊕ ; cortical cells obtained by retting wool with bacteria for 4 months, ◑ , and for 14 months, ● ; and cortical cells prepared by grinding wool in a carpet-testing machine, ○ .

The results as shown by the curves indicate that all three samples of cortical cells and the sample of scales have the same electrophoretic properties and are isoelectric at pH 4.5 in the buffer system used. It has been suggested by many investigators that an intercellular phase exists between the cortical cells and is removed during prolonged treatment of fibers with certain reagents such as concentrated ammonia[17], or during retting [18]. If it is assumed that all such material would be removed during the long retting process, but that the cells obtained by mechanical action would still contain some of it, then the only conclusion which may be drawn from the present investigation is that if such a phase exists, it necessarily has the same electrophoretic properties as the outer surface of the cortical cells. Alternative conclusions that the intercellular phase is not completely removed during these treatments or that one does not exist are obviously not eliminated by these results.

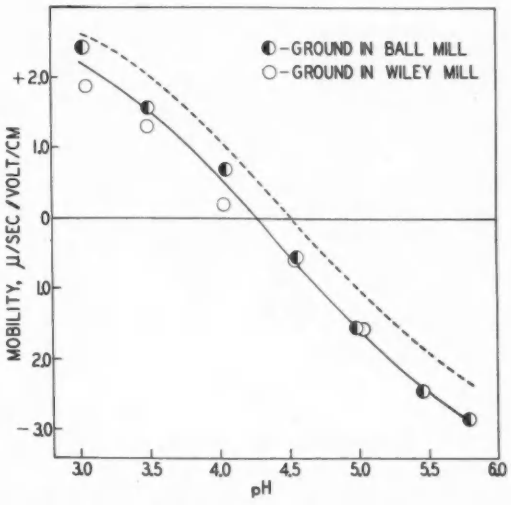


Figure 3. A comparison of the pH-mobility curves in 0.005 *M* ionic strength acetic acid-sodium acetate buffers of wool ground in ball mill and Wiley mill. The broken line, identical with the smooth curve of Figure 2, is included for comparison.

(3) Electrophoretic Properties of Ground and Powdered Wool

Figure 3 shows the pH-mobility curve for samples ground in a laboratory Wiley mill (open circles) and in a ball mill (closed circles). The dotted curve is the curve taken from Figure 2. It has been shown elsewhere[19], and in this laboratory that the action of the ball mill results in a lowering of the cystine content of wool, which suggests that the shift in the curve to lower pH values may have resulted from such degradation. It would appear, however, that the action of the Wiley mill is much less drastic, since no measurable degradation was exhibited by the ground fibers as a whole. However, since only the smaller particles obtained from the Wiley mill were used in these measurements, the possibility that they may be more degraded than the larger particles still exists.

Against the possibility that the shift may have resulted from such degradation, it must be pointed out that the action of both the Wiley mill and ball mill is such that the cortical cells are ruptured or cut and the intracellular substance exposed. This substance may have different electrophoretic properties than the remainder of the fiber. If this were the case, its isoelectric point would be expected to be even lower than that shown in Figure 3, since the solid curve is probably a composite of the curves for scales, cells, and intracellular substances. Further work is necessary to determine which of these postulates is correct.

IV. SIGNIFICANCE OF THE ISOELECTRIC AND ISOIONIC POINTS

It has generally been assumed that the isoelectric point of wool represents the point of maximum stability of the fiber. Although isoelectric points of some proteins appear to be close to the points of maximum stability, they are not necessarily the same. Actually, it is possible for the stability region of a protein to be far from the isoelectric point[20]. Whether the point of maximum stability will be at or near the isoelectric point will depend upon the reactivity of specific linkages in the molecules. For example, assume that a protein containing disulfide linkages from the amino acid cystine has an isoelectric point in the alkaline region as a consequence of a high content of either lysine or arginine. In view of the known instability of disulfides in even weakly alkaline solutions, it is very unlikely that the point of maximum stability of such a substance would be located near its isoelectric point.

The concept of the isoelectric and isoionic points, however, can be utilized in practical wool processing. Since the isoionic point involves only the acidic and basic properties of the fiber, it should be considered in studying such wool processes as are related to these properties. Dyeing with soluble dyes[21], felting, and removal of ash constituents from the fiber are processes that probably fall within this category. In addition, the swelling and tensile properties of wet fibers are a function of the state of their acidic and basic groups[4, 22].

The isoelectric point, on the other hand, is concerned principally with the total net surface charge, and must only be considered in relation to processes involving either the removal or deposition of materials on the surface of the fiber. In other words, it would play an important part in such processes as scouring and finishing. Scouring is facilitated when the charge on a fiber and the charge on the material being removed from the fiber are the same and therefore tend to repel each other. For example, dirt particles and particles of most inert substances carry negative charges. Obviously then such macroscopic particles are best removed from fibers which also have a large net negative charge. Similarly, the deposition of certain finishing materials on fibers or fabrics is best accomplished when the charges on the fibers and material to be deposited are of opposite sign. While the dyeing problem is undoubtedly more complicated, it is probable that dyeing with colloidal dyes is related to the isoelectric point.

V. REFERENCES

[1]H. A. Abramson, Electrokinetic Phenomena (The Chemical Catalog Co., New York, N. Y.) (1934).
[2]H. A. Abramson, Cold Spring Harbor Symposia Quant. Biol. *1*, 39 (1933).
[3]L. S. Moyer, Ibid. *6*, 228 (1938).
[4]J. B. Speakman and E. Stott, Trans. Far. Soc. *30*, 539 (1934).
[5]M. Harris, BS J. Research *8*, 779 (1932) RP 451; Am. Dyestuff Reptr. *21*, 399 (1932).
[6]S. P. L. Sorenson, K. Linderstrom-Lang and E. Lund, J. Gen. Physiol. *8*, 543 (1927).
[7]J. Steinhardt and M. Harris, in preparation for publication.
[8]H. A. Abramson and L. S. Moyer, J. Gen. Physiol. *21*, 729 (1938).
[9]J. B. Speakman and E. Stott, Trans. Far. Soc. *31*, 1425 (1935).
[10]J. O. Burton and R. H. Rasch, BS J. Research *6*, 603 (1931) RP 295.
[11]H. F. Schiefer and R. S. Cleveland, BS J. Research *12*, 155 (1934) RP 640.
[12]L. S. Moyer, J. Bact. *31*, 531 (1936).
[13]H. A. Abramson, J. Gen. Physiol. *12*, 711 (1929).
[14]H. A. Abramson, L. S. Moyer, and A. Voet, J. Am. Chem. Soc. *58*, 2362 (1936).
[15]D. I. Hitchcock and A. C. Taylor, J. Am. Chem. Soc. *60*, 2710 (1938).
[16]A. M. Sookne and M. Harris, J. Research NBS *23*, 299 (1939) RP 1234.
[17]R. Haller and F. W. Holl, Kolloid-Z. *75*, 212 (1936).
[18]E. D. Stakheeva-Kaverzneva and N. I. Gavrilov, Bull. Soc. Chim. (Mém.) *4*, 647 (1937); J. B. Speakman and P. R. McMahon, Nature *141*, 118 (1938).
[19]J. I. Routh and H. B. Lewis, J. Biol. Chem. *124*, 725 (1938).
[20]P. S. Lewis, Biochem. J. *20*, 965, 978, 984 (1926); *21*, 46 (1927); J. Steinhardt, Kgl. Danske Videnskab. Selskab, Math.-fys. Medd. *14*, No. 11, 1 (1937).
[21]A. L. Smith and M. Harris, J. Research NBS *19*, 81 (1937) RP 1012; Am. Dyestuff Reptr. *26*, P416 (1937).
[22]J. B. Speakman, Trans. Far. Soc. *29*, 148 (1933); A. M. Sookne and M. Harris, J. Research NBS *19*, 535 (1937); Am. Dyestuff Reptr. *26*, P659 (1937).

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Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

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IMPORTANT NOTICE
To Prospective Employers

Complete personal histories and employment records of the following applicants are now on file at the office of the American Dyestuff Reporter and with the secretary of the Association. These may be examined by prospective employers or copies will be loaned upon application.

A-B-7

Education—Evening school in textile dyeing and chemistry.

Experience—Dyehouse laboratory for 2 years. Foreman dyer and finisher on hosiery for 9 years. Experience on ribbons also vat dyes on rayon and silk skeins. 2 years assistant to superintendent. Desires position either in demonstrating and sales or dyer; New York Viciniy. Age 33; married.

A-B-8

Education—Graduate Chemist.

Experience—Print superintendent, colorist; eleven years' experience in all types of fabrics, specializing on rayon; 8 years' dyestuff laboratory and demonstrating. Excellent references; age 36; married.

A-B-9

Education—Bradford Durfee Textile School, 1918, chemistry and dyeing course.

Experience—Dye application, textile and color chemist; good general factory, laboratory and office experience; accustomed to assuming responsibility; handled all types of help; purchased chemicals, dyes, etc.; executive ability; good personality.

Age 42; American, married; will go anywhere for interesting work; references.

A-B-10

Education—1 year of textile chemistry, day course, Philadelphia Textile School; also business course.

Experience—3 years as apprentice in weaving mill in Germany, office and stock room, general clerical work, practice in all departments of cotton manufacture, dyeing, bleaching and finishing of cotton-rayon mixtures, piece and package processing; several mos. in laboratory of German dyestuff manufacturer, dyestuffs and assistants and their application, vat and naphthol dyeing.

Age 20; will go anywhere in U. S.

A-B-11

Education: Graduate chemist. Correspond and converse German, some French.

Experience: 3 years dyer; 4 years dyestuff testing, troubleshooting, purchasing; 4 years demonstrating, consulting, and supervising for large dyestuff manufacturer. Thoroughly experienced on rayon, cotton, silk, acetates, printing, vats. Fullest references as to character and ability. Seeks position as technician, consultant, or superintendent with reliable dyestuff sales organization or dyehouse. Age 33, married.

A-B-C-4

Education—Educated abroad.

Experience—Twenty years experience in the textile field as bleacher, dyer, finisher and chemist. 16 years in charge of dyestuff laboratory of large dyeing plant, 4 years as chief chemist with large bleachery. Has tested dyestuffs, and chemicals used in the textile field and has manufactured soaps and textile specialties. Has handled all textile fibers; bleaching, printing, dyeing and finishing same. Has done pigment and lacquer printing, waterproofing and fireproofing. Reason for leaving last position was due to business conditions.

Age 41; married.

A-B-C-6

Education—English Municipal School of Technology; Board of Education, So. Kensington Chemistry Certificates; City & Guilds of London Institute in Bleaching and Dyeing.

Experience—In U. S. A. 22 years as chemist and chief chemist with one of the largest textile plants in the country; expert colorist; long experience with permanent and semi-permanent finishes. Specialist on vats, naphthols and indigosols. Age 50; married.

A-B-C-7

Education—B.S. in Textile Chemistry and Dyeing, 1939, North Carolina State College.

Experience—None. Seeks position as textile chemist and colorist. Age 21; single.

A-B-C-8

Education—B.T.C., 1933, Lowell Textile Institute.

Experience—5 months as rayon slasher tender; 8 months color matching, dye testing and analytical work; 5 years with large print works in rayon finishing department, laboratory, color matching, dye testing, assistant rayon dyer. Seeks position as rayon dyer, assistant dyer, or any job in a rayon dyeing and finishing plant. Age 29; single.

A-B-C-9

Education—Lowell Textile Institute; chemistry, dyeing and textile finishing.

Experience—Twelve years head dyer in hosiery mills. Dyeing all types of fibers and in combination. Knowledge of all dye applications. Matching and formula making. Charge of every department in a hosiery mill except fixing machinery. Has done jigg work on cottons and rayons. Desires position in hosiery, or in any field. Would like to work as an assistant to head dyer in a woolen or rayon mill. Age 42; married. Will go anywhere in the United States.

A-B-C-D-1

Education—Lowell Textile Institute, Bachelor of Textile Chemistry; Lowell Textile Institute (Evenings), 2 years D. C. Electricity; 2 years A. C. Electricity.

Experience—Six years as chemist and assistant dyer with a large organization. Specialized in dyeing, finishing, bleaching and drying of woolens, worsteds, cottons, rayons and unions in the piece. Some sales experience. Desires position as chemist, dyer, finisher, bleacher or sales. Age 30; American citizen; Married.

A-B-C-E-1

Education—3 years Chemical Engineer major in College, Honor graduate Philadelphia Textile School, Chemistry and Dyeing Course.

Experience—Chemist-Colorist for three years with dyestuff company, Assistant Chief Chemist for 1 year with silk and rayon printing and dyeing plant. Chief Chemist and Director of Research with Cotton Bleaching, Dyeing, Printing & Finishing Plant 4 years. Can install Rapidogen system, including construction and necessary equipment, and formulation of standards. Instructor of Textiles and Textile Chemistry, with State Vocational School 2 years. Married, age 32, references, will go anywhere.

A-B-C-F-1

Education—Textile institute course; extension work at Brown; executive training with Alexander Hamilton Institute; knowledge of German.

Experience—Dyeing executive in all types of textiles, including stock, yarns, and piece-goods. Thorough knowledge of all classes of dyes and dyestuffs, and their successful practical application in the plant. Wide experience in all types and makes of equipment used in dyeing, bleaching, mercerizing and finishing. Laboratory practice in planning and checking methods and processes, costing and purchasing. Good manager personnel for efficiency and satisfactory results economically obtained. Cotton, rayon and silk, some acetate rayon, and mixed fabrics. Excellent references; in excellent health.

A-B-C-F-2

Education—Lowell Textile Institute, 1911.

Experience—26 years in cotton yarn and piece goods finishing plants; expert on naphthols, vats and other cotton and rayon dyeing; all types of control work and testing; analytical processes; purchasing of dyes and chemicals. Age 46; excellent references; in perfect health; will go anywhere; married.

B-5

Education—High School and Textile School Graduate.

Experience—Twelve years overseer of dyeing on directs, vats, naphthols, sulfur, basic and developed colors. Also experienced bleacher. Age 40; married; references.

B-7

Education—Municipal School of Technology, England. Chemistry certificates of Board of Education, So. Kensington. Bleaching, Dyeing and Printing Certificates of City Guild of London Institute.

Experience—In U. S. A. 16 years as assistant and colorist in large plants, all styles of fabrics.

Age 46; married.

B-C-3

Education—Graduate, Philadelphia Textile School; speaks German fluently.

Experience—Employed at velvet company for 7½ years. Past 2 years working in finishing department on regular, waterproof and crush-resistant finishes (resin finishes). Can take charge of finishing of velvets. Have some piece dyeing experience.

29 years of age; married; will go anywhere.

B-D-1

Education—General education in England. Chemistry and Dyeing Courses at Huddersfield Technical School.

Experience—Has been a superintendent of dyeing since 1911. Has had experience in worsted mills, hosiery mills and woolen mills. Congenial, sober and reliable. Married; references; age 53.

F-1

Education—Two years high school; 6 years evening engineering school; 1 year evening textile school; 1 year industrial management; course in accounting.

Experience—Ten years in an executive capacity in full fashioned hosiery manufacturing business. Familiar with entire manufacturing procedure, finishing dept., dyehouse and office. Specialized in finishing dept. and has good eye for color, finish and quality. Had responsibility of all orders going through mill, stock, grey goods and traffic. Five months in New York sales office. Gets along well with people and contact with employees and customers has always been satisfactory. Previous to hosiery experience was in a mechanical business for 17 years.

43 years of age; single, in good health; will go anywhere.

Complete Reports

of the

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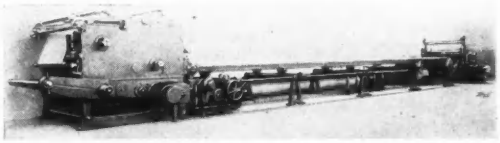
Proceedings of the A. A. T. C. C.

Rayon Fabrics—

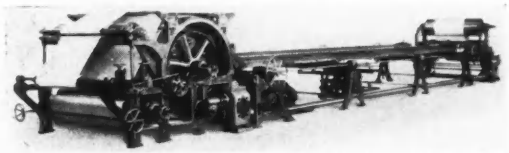
(Continued from page 578)

No. 1—Heavy pressure quetsch.
Vacuum extraction machine.
Tenter frame.
Palmer finishing machine.
No. 2—Heavy pressure quetsch.
Tenter frame.
Palmer finishing machine.
(See Figure No. 40 for layout No. 3.)
No. 3—Heavy pressure quetsch.
Drying cylinder.
Tenter frame.
Palmer finishing machine.



Photo, Courtesy, Morrison Machine Co.

Fig. 39—Triune Finishing Machine Showing Delivery End. (See Lay-out No. 1 as to Units)



Photo, Courtesy, Van Vlaanderen Machine Co.

Fig. 40—Palmer Tenter Unit Showing Delivery End. (See Lay-out No. 3 as to Units)

The function and description of a quetsch and vacuum extraction units have been fully covered earlier in this article. On the Palmer tentering unit, the tenter frame usually consists of four ten foot units (40 foot frame) which are heated by large size steam coils completely enclosed or a gas booster heater where gas is available.*

This tentering unit must possess sufficient drying action so that the goods leaving it and entering the Palmer finishing machine are partially dried so as to prevent wetting of the wool blanket which covers the large drum on the Palmer.

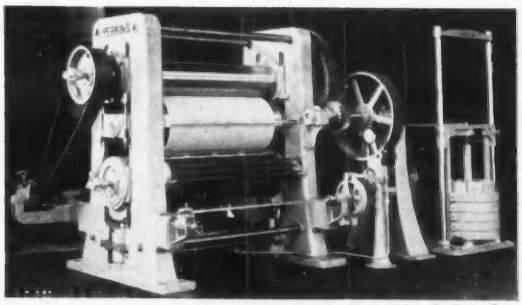
A Palmer tentering unit consisting of the machines under either layout Nos. 1, 2, or 3 is operated as one unit by a variable speed drive with the necessary compensating devices to prevent tear or excessive tension on the goods under process.

The Palmer finishing machine usually consists of two drums, a large and small one which are heated by steam, and a beaming arrangement for batching dried goods as they leave the large drying drum.

The small drum acts only as a drying form for the wool blanket and heating it as it enters onto a large drum which carries the blanket only.

Proper care in the heating of these drums is essential

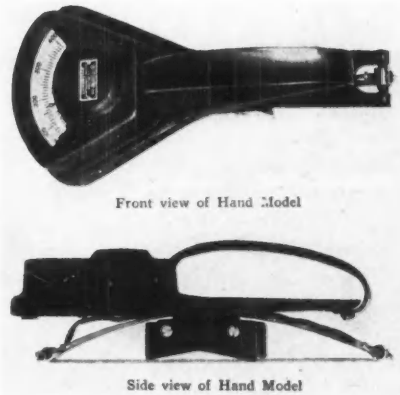
*See Part IV—The Processing of Acetate and Viscose Rayon Fabrics. American Dyestuff Reporter, January 9th, 1939.



Photo, Courtesy, B. F. Perkins & Son, Inc.

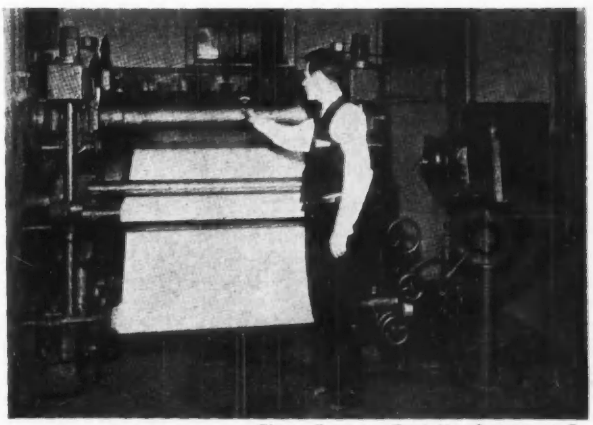
Fig. 41—Three-Roll Calender (Hydraulic Pressure Type Equipped with a Pressure Range of 1-100 Tons)

and the operative opens a small valve on the side of a large drum so as to permit air present to escape before the steam is turned on for heating. Twenty to forty minutes is allowed for the proper heating of the drums before the Palmer unit starts running the goods over the Palmer finishing machine. Twenty-five to thirty-five pounds steam pressure is usually required for proper drying and finishing of goods. The drying temperature of the large drum is kept around 220° F. and this is checked by using a surface pyrometer. (See figures 42 and 43.)



Photo, Courtesy, Cambridge Instrument Co.

Fig. 42—Surface Pyrometer



Photo, Courtesy, Cambridge Instrument Co.

Fig. 43—Checking Temperature of Heated Textile Finishing Roll with a Surface Pyrometer

This pyrometer can be used in checking the temperature on all drying and embossing cylinders. It is a worthwhile instrument as it acts as a double check on the steam pressure gauge which may be stuck and give an erroneous reading which is doubly dangerous to the life of the acetate fabrics as well as all persons operating machines composed of steam heated cylinders or drums.

The speeds on a Palmer tentering unit ranges from 25 to 75 yards per minute dependent upon the weight of the fabric being finished. Acetate fabrics are dried and finished at the lowest temperature possible consistent with economical production so as to prevent an over-drying which causes a glossiness or stove-pipe effect on the finished goods.

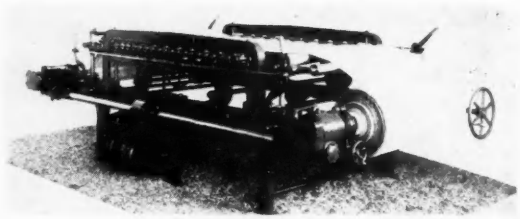
The dried goods are kept free from wrinkles by using a frame holding a heavy paper which is hooked onto the rod beneath the cloth as it starts onto the shell from the large drum. The paper covers only a small part of the beaming shell and thus gives a smoothing out effect for the dried goods.

OPERATING SUGGESTIONS ON A PALMER FINISHING MACHINE

1. Heating of drums preparatory to operating and during operation.
   a. Blowing out air present.
   b. Sufficient time for steam to enter and heat drum uniformly.
   c. Checking of surface temperature of drum with a surface pyrometer to prevent over drying of goods.
   d. Necessary steam pressure.
2. Proper care and manipulation of woolen blanket over large drum.
3. The entire Palmer tentering unit should be kept in continuous motion during the drying of the goods as stoppage may cause:
   1. Scorching of blanket, reducing life of it.
   2. Marking off on goods in process.
4. Proper manipulation of centering devices so that drying blanket is on the middle of large drum; this gives even tension and prevents doubled selvedges.
5. Proper manipulation of variable speed control so as to prevent the goods leaving any one unit and entering the other in a slack condition.
6. Keeping the clips of the tenter frame clean so as to prevent marking off on selvedge of goods.
7. Keeping drums of Palmer clean so as to prevent marking off on blanket and goods during drying operation.
8. Proper manipulation of goods entering tentering quetsch and tentering frame so as to keep it straight. Use similar precautions as noted in Part IV on the drying of crepes.
9. Routine check as to lubrication and inspection of steam valves and gauges.

CALENDERING OF FLAT-GOODS

Refer to Part IV, under the method of calendering crepes for a description and operating procedure for acetate flat goods as they are calendered for similar purposes as outlined in Part IV under "Calendering." (See Figures 27 and 28, Part IV, Figure 41, Hydraulic calender.) Flat goods are usually calendered under more pressure and hotter cylinders than used on acetate-viscose rayon crepes.



Photo, Courtesy, Van Vlaanderen Machine Co.

Fig. 44—Nineteen-Roll Button Breaker (Equipped with Bakelite Button Breaker Rolls)

Light weight goods and taffetas are given a calendering at 150-180° F. with medium pressure. The temperature of cylinders should be checked always so as to insure a uniform finish from lot to lot of goods.

On heavy weight goods and especially the heavy lining fabrics, the goods are given a cold calendering so as to give a medium bodied hand with a light break with a dull finish. To obtain a fuller and firmer bodied hand the goods are given a calendering at 130-160° F. but care must be exercised or the hotter cylinder will cause a glossy finish on heavy shades, blacks, and navies.

If goods dried on the Palmer tend to mark off it is then advisable to calender under greater pressure and cooler cylinders than on shades not marking off.

The purpose of calendering flat goods is similar in most cases as that on the crepe fabrics though calendering is used on practically all types of flat goods and chiefly on crepes to remove marking off troubles and to help to give a dull effect on finished fabric.

The average speed of calendering flat goods ranges from 40-60 yards per minute.

BUTTON-BREAKER

If a fabric finishes up boardy and stiff, and a finisher cannot obtain the desired softness, mellowness, and break on the goods they may give a run on the button-breaker machine to "break" the boardiness (See Figure 44—Nineteen roll button breaker). This machine is seldom used and many finishers prefer to give a lot of goods another run through a calender with added pressure to secure the desired hand and break.

The modern type of button breaker (Figure 44) is of reversible type, adjustable rolls, and rolls made of Bakelite. The newer type machines possess certain advantages over the older types with brass rollers. These are:

1. Elimination of mark-offs which are caused by friction with brass rollers and Bakelite is freer from this trouble.
2. Elimination of broken brass buttons causing tears.
3. Bakelite rolls possess longer life than the brass rolls.

INSPECTION OF FINISHED GOODS

The calendered goods are framed, then given a final inspection on a tilted type of inspection table. Special types of lighting arrangements are used for cloudy days and night inspection work.

It is preferable that all goods be given a final inspection under both a north-east day light as well as a specialized textile lighting arrangement. Such an inspection will help detect defects that are not seen on inspection under just one type of light.

After final inspection for shade and hand the goods are tubed ready for the shipping department.

TRADE NOTES • NEW PRODUCTS

OBITUARY

CANFIELD JORDAN

CANFIELD JORDAN, president of the W. H. & F. Jordan, Jr. Mfg. Co., manufacturers of textile chemicals, died on September 11th, at the Chestnut Hill Hospital, Philadelphia, Pa.

A native of Philadelphia, he was descended from Jasper Yeates, who settled in this country in the 17th Century. His great-great-grandfather was Frederick Jordan, who fought at Yorktown, and another ancestor was William Henry, a member of the Continental Congress. He was the son of the late Gilbert and Ellen Poinier Canfield Jordan. He was a member of the Sons of the Revolution and the Masons. His home was at 7102 McCallum Street, Chestnut Hill.

Surviving him are his wife, Blanche Williams Jordan; four sons, William Henry, Thomas Canfield, James Caldwell and John Bevan Jordan, and a sister, Mrs. Emily Jordan Benerman. Funeral services were held Friday, September 15th, at 1820 Chestnut Street.

• JACQUES WOLF RELEASE

Jacques Wolf & Co., Passaic, N. J., has released a folder describing the following product:

Oranap—(sodium-alkyl-naphthalene sulfonate)—a new synthetic penetrating, spreading and cleansing agent. This product is said to reduce surface tension, thereby giving exceptional penetration, wetting-out and dispersion. It is supplied as a highly concentrated paste. It is said to be completely soluble not only in water but in strongly acid and alkaline solutions. Water solutions of Oranap are practically neutral in reaction, having a pH value of 6.5 to 7.0. The product will find use in the following operations: as an aid in the scouring and kier boiling of cotton, the scouring of wool and the scouring of rayons, silk, linen, etc.; as an assistant in the dyebath; and when added to printing pastes it is said to give uniform penetration and speed. The product also has many uses outside the textile field.

• GENERAL RELEASE

General Dyestuff Corp., 435 Hudson St., New York City, has released a circular describing the following product:—*Benzoform Brilliant Blue G*—a direct color which, on after-treatment with formaldehyde, produces on cotton and rayon a bright greenish blue said to be of satisfactory fastness to washing and of very easy dischargeability. Circular G—172.

• ROHM & HAAS RELEASE

Rohm & Haas Co., Inc., 222 West Washington Sq., Philadelphia, Pa., has recently released the third in a series of circulars describing the RHoplex resins. The series presents a discussion of the outstanding properties of these aqueous dispersions and suggestions for their application to textiles. Copies are available upon request.

• CIBA RELEASES

The following publications have been issued by the Ciba Company, Inc., representing the Society of Chemical Industry in Basle, announcing new products and processes.

Chlorantine Fast Brown 10 GLL—a new member of the Chlorantine Fast LL series, which dyes a still yellower shade than the former 8 GLL type and which shows an improved fastness to light, better dischargeability and levelling qualities. Chlorantine Fast Brown 10 GLL is recommended by the manufacturers for the dyeing, in light-fast shades, of cotton, both yarn and piece and rayon in yarn and piece. On half-silk goods, in a neutral Glauber's salt bath, the silk is dyed heavier than the cotton. In union dyeing Chlorantine Fast Brown 10 GLL is suitable for covering the cotton at a temperature of 140° F., or at higher temperatures with the addition of Albatex WS. After-treatment with Sapamine KW or Lyofix DE makes the shade somewhat yellower, but improves the fastness to water and acid cross-dyeing yet does not greatly influence the fastness to light. The dyeings of Chlorantine Fast Brown 10 GLL may be discharged to a clear white, using either a neutral or alkaline discharge; this is equally true of cotton, rayon or silk. Circular No. 508.

Chlorantine Fast Yellow 2 GLL. (patent applied for)—this new product is said to be characterized by an outstanding fastness to light, excelling materially all former members of the Chlorantine Fast color series. Chlorantine Fast Yellow 2 GLL is recommended by the manufacturers for fast to light dyeings on cotton and rayon, both yarn and pieces. Rayon of unequal affinity is dyed uniformly, mixed fabrics of cotton and rayon may be dyed with this yellow to a very good uniformity. Acetate rayon is reserved, even in large effects. In half-silk goods, the silk will remain pure white if dyed in an alkaline bath. Wool, in half-wool goods, is not tinted at temperatures under 140° F., at higher temperatures the use of Albatex WS is recommended when filling up the cotton. After-treatment of the dyeings with Sapamine KW or Lyofix DE improves the fastness to water, perspiration and acid cross dyeing, without greatly affecting the fastness to light. Dyeings on cotton, or rayon are not dischargeable. Circular No. 509.

Cloth Fast Yellow 8 G—a new homogeneous dyestuff, which is said to arouse much interest on account of its pure greenish shade; it is dyed on wool from an acetic acid bath. The fastness to light of Cloth Fast Yellow 8 G is a trifle less than Cloth Yellow GG. Fastness to washing, fulling, water and sea water is said to be rated as good. Cloth Fast Yellow 8 G is especially recommended, in combination with Brilliant Cyanine G and Alizarine Fast Green G, for the production of lively yellowish to green tones on worsteds, loose wool or yarn, woven goods and knitting yarns fast to sea water. The new dye is also suited for piece dyeing, cotton and rayon effects are reserved. Cloth Fast Yellow 8 G is suited for dyeing pure-dye and tin weighted silk from a weak acetic acid bath. In unions and yarns spun from wool and cut staple fiber, this dyestuff is taken up by the wool from a neutral bath. Dyeings on wool or silk are dischargeable to a pure white, but the product is not suitable for direct printing. Circular No. 511.

• HERCULES APPOINTMENTS

Hercules Powder Company has announced the appointment of three executives to important positions in the Naval Stores Operating Department.

A. S. Kloss, formerly manager of Georgia Naval Stores Operations, with headquarters at Brunswick, Georgia, has joined the Operating Department of the Naval Stores Department in Wilmington. He will devote his time to the coordination of naval stores sales with naval stores manufacturing and operating problems.

Reginald Rockwell, formerly superintendent of the naval stores plant at Brunswick, Georgia, has been appointed manager of Georgia Naval Stores Operations.

George E. Bosserdet, formerly a supervisor of the naval stores plant at Hattiesburg, Mississippi, will succeed Mr. Rockwell as superintendent of the naval stores plant at Brunswick, Georgia.

• NYLON PLANT

E. I. du Pont de Nemours & Company has made the following announcement:

"Prospective demands for nylon necessitate increasing the plant facilities at Seaford. The original plans for the first unit, now in the course of construction, called for nine spinning machines. In keeping with a "balancing out" program recently adopted, the total will be increased to twelve. The Executive Committee has directed the Engineering Department to proceed with designs for a second unit at Seaford. Details incident to the second unit wait upon completion of the engineering activities."

• REPRESENTS EMERY INDUSTRIES

Emery Industries, Inc., Cincinnati, announces the appointment of Mr. W. H. Shields as its Southeastern Sales Representative with headquarters in Charlotte, N. C.

Mr. Shields comes to Charlotte after 14 years with the company, serving in various capacities in the Chemical and Sales Departments. His extensive experience with the Emery line of Stearic Acid, Red Oil and Twitchell Products, makes him extremely well qualified to serve the textile industry in the southeast.

• VAT DYED LABELS

A new development in the production of cloth labels resulting from the perfection of a process for manufacturing vat-dyed, multi-colored labels, has been announced by Arthur Rosenthal, president of the Rose Patch & Label Co., Grand Rapids, Mich.

The new development is expected to be of widespread interest in all phases of the textile field as well as for manufacturers in the apparel industries, because of its many advantages as well as economies over the woven type labels now in use.

FLIGHT OVER BOSTON

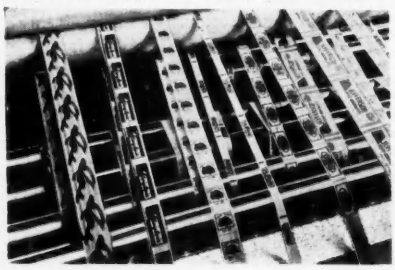
In the photograph at the right is shown a group of men who had the pleasure of making a flight over the city of Boston in Mr. E. W. Wiggins' new Beechcraft plane during the recent A.A.T.C.C. convention. Reading left to right, they are: W. A. Diamond, The Oneida Bleachery, Inc., H. W. Doyle, Myrtle Knitting Mills, F. C. Broadbent, Geigy Co., Inc., C. T. Worthen, F. C. Huyck & Sons, and E. C. Hilton, Geigy Co., Inc.

Photo by T. F. Hartley

"The market for these labels is practically unlimited," stated Mr. Rosenthal. "They can be used by every manufacturer of cloth and fabric goods in the country, from sheets and wash cloths to fine women's and children's dresses and men's wear, including even overalls, athletic equipment, some shoes, awnings, tents, and identification of upholstered furniture. This is the first and only Vat-Dyed cloth label in multi-colors to be produced.

"One of the largest independent testing laboratories in the United States put our Vat-Dyed labels through twenty successive severe washing tests, with high powered cleaning solutions," stated Mr. Rosenthal, "and they came out even sharper and clearer than before the washing." It is claimed that the full color and detail of the design will really outwear the cotton fabric it is processed on. The design is practically indestructible.

New multi-colored wash-proof vat-dyed cloth labels emerging from one of a series of dye baths and rinsing baths in the Rose Patch & Label Co. process.



"Other advantages of this new Vat-Dyed label," explained Mr. Rosenthal, "are manifold. The lettering is clearer and sharper; full color designs of the most elaborate and intricate nature can be reproduced, even to facsimile of portrait photographs and other elaborate artwork never before possible to work out on a cloth label. It is very probable that this new process may revolutionize the design of cloth labels, because of the new and beautiful effects this Vat-Dyed process now opens up. Furthermore, these superior Vat-Dyed labels cost less than the woven kind."

Three distinct processes in the production of the new Vat-Dyed labels are all the result of original machines developed and invented by Mr. Rosenthal. These are: First an automatically fed 3-color press which imprints the design and lettering of the label on large strips of label cloth, held on reels like motion picture film. Second is the newly developed patented and secret process for the genuine Vat Dyeing, which with the special dyes used, is responsible for the long sought for wash-proof qualities of the labels. Third is an ingenious machine, controlled by an electric eye, which in a series of automatic operations cuts, folds, irons, counts, and finally delivers the labels neatly inserted in cartons ready for shipment.

Cannon, Fruit-of-the-Loom, Utica, and Mohawk are a few of the leading users of cloth labels for whom the new Vat-Dyed labels have already been produced.

• CLASSIFIED ADVERTISEMENTS •

POSITION WANTED: Dyer with 25 years' practical experience of dyeing of silk, rayon and acetate. Able to take full charge or supervise all operation of dyeing, laboratory praxis, expert in dyeing of fast colors. Best references, desires position as Dyer, Supervisor or Demonstrator. Will go anywhere. Write Box No. 199, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Young man; knowledge of chemistry; speaking fluent German, dyehouse, dye laboratory, textile and commercial experience seeks position with chemical or textile firm in New York City area. Write Box No. 214, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

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